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The Engineering and Mining Journal

Vol. 94 DECEMBER 7, 1912 No. 23

The Impending Tariff Changes

Business is undoubtedly uneasy in fear of coming tariff legislation. Recognizing that reductions are going to be made, we fancy that the adverse effect upon any particular industry is going to be much less than is dreaded. In the manufacturing industries the owners of modern plants have but little to fear. The laggards will be inspired to improve their processes and equipment; and by increased efficiency maintain their place in competition. The producers of raw material will be least able to do this, and it is from them that most opposition to tariff reduction will probably come, although economically a tariff on raw material is the most indefensible.

"The reaction against protection, if it should come," says Professor Taussig, in "Principles of Economics," "ought to proceed by gradual and tentative steps. This sort of consideration, however, need not be shown with regard to many raw materials, in producing which no considerable plant is needed."

Yet we expect that it will be with respect to raw materials that the most serious opposition to tariff reduction will be experienced, because therein will vested interests be most irremediably hurt. The manufacturer may modernize his mills. The producer of lumber and lead may not alter the adverse conditions of geography or the lean bounty of nature. If it were only the original exploiters of such resources that were affected, the case would be more simple. It might be said to them, "You have been assisted long enough. Be content." But their property has been capitalized under artificial terms, and upon such bases has been to a more or less extent transferred to investors; and to detract summarily from the earning power of their principal is not a matter for careless legislation.

In the mining industry the subjects of most concern are zinc, lead, iron and their respective ores. In none of these cases, however, do we think that realization will be so bad as the forebodings. The average prices for spelter at St. Louis and London during the 10 years ending with 1911 were about 5.35c. and 5c., respectively; for the 20 years ending with 1911 they were about 4.73c. and 4.51c., respectively. To Pittsburgh, the great spelter consuming center, the freight from St. Louis and from Atlantic ports is about the same, and foreign spelter must, moreover, stand the ocean carriage. Manifestly an abolition of the duty on spelter would make no great difference in the long run. It would, however, certainly tend to equalize market conditions and prevent such extravagances as have been experienced in the domestic market in 1911-12.

In lead the respective 10-year averages have been about 4.56c. and 2.91c.; the 20-year, 4.17c. and 2.77c. Here we have much greater differences than in the case of spelter. An abolition of the tariff on lead would unquestionably reduce the American price, but certainly not to the previous European level, because the latter would be raised by American buying. The world's supply of lead and the demand for it are too nearly in balance to permit any deluge from any source if the tariff barrier were removed.

The present tariff on iron ore is 15c. per ton, which corresponds to the railway freight for about 30 miles. It is inconceivable that the removal of this low tariff would have a disastrous effect upon our iron mining. As to the tariff on steel products, Mr. Carnegie has expressed himself with clearness and emphasis.

There is not the slightest probability that the duties on lead and spelter will be entirely removed. The chances are that the reductions will be but moderate. Important readjustments in commercial operations will, no doubt, become necessary, and the uncertainty about these will naturally create nervousness, but in the end we fancy that no one will find him-

self hurt so badly as he now thinks.

The copper producers of the United States exploit lower grades of ore than anywhere else, in places remote from the markets for copper consumption, pay the highest rates of wages, export nearly 50% of their product, command the world's market and do all of this without the enjoyment of any tariff.

The Nipissing High Grade Mill

Elsewhere in this issue, R. B. Watson, general manager of the Nipissing mines, describes the remarkable metallurgical process invented by Messrs. Butters, Clevenger and Johnson and introduced by the Nipissing company for the treatment of its high-grade silver ore.

This process has been heretofore referred to casually or briefly in the pages of the technical press, but Mr. Watson's is the first full and authoritative account of it. The process is no longer of experimental character, many thousands of tons of ore yielding many millions of ounces of silver, having been worked by it.

The process comprises amalgamation and cyanidation, applied in a novel combination. The chief operation is tube-mill amalgamation, a tube mill of special design being charged with 20-mesh ore, 5% cyanide solution, a large proportion of mercury and pebbles. In nine hours of running at relatively high speed, about 97% of the silver is amalgamated. The amalgam is separated and sent to the retorting department while the pulp of the ore passes to the cyaniding department where a further quota of its silver contents in extracted.

The total extraction of silver is phenomenally high, just how high may not be said unfortunately, because there are good reasons why that figure should not be disclosed. Apart from its high extraction of silver the process is further remarkable in that no loss of mercury is experienced, bullion of high fineness is turned out in a few hours of operation, disputes with smelters and loss of interest on the value pending settlement being avoided, and finally the first cost of the plant was remarkably low. In view of these advantages a high cost of operation may be borne and still leave a large profit as compared with the old method of dealing with this ore.

In the handling of the large quantity of amalgam resulting from this process the metallurgists were obliged to dismiss all precedents and devise new apparatus suitable to their conditions. The Nipissing refinery is one of the most important and interesting parts of the plant, and the description of it may be studied with profit by many. Whether the Nipissing process of barrel amalgamation and cyanidation is capable of application elsewhere, or is limited to the peculiar conditions for which it was designed, it must anyway be recognized as a remarkable triumph of metallurgical skill.

Respecting Processes

There are many metallurgical processes brought out each year and heralded by the semi-technical press as marking a new epoch in the history of certain metals. How few of them finally take a place in the books of metallurgical experience! Some of these advertised processes may possess merit, but it is, alas! too often that they are made the basis of stock-selling operations before their merit is determined. The purchase of shares is recommended by irresponsible promoters to the public as an unusual opportunity for conservative investment, before the process has been tried on a working scale. The average layman is unable to pick his way through the mazes of the semi-scientific fol-de-rol, or even the logical scientific statements, that are offered, but when he reads that the cost of treating a ton of ore by the new process is to be only $1, where in the past it has been from $2.50 to $8, he immediately concludes that here is a great commercial opportunity.

Let us examine for a moment the basis upon which rest the low-cost claims of most of these new processes. Were the layman to ask engineers for assistance, he would find that they are able to help him but little, for the reason that those in charge of new processes of the type we have in mind usually fail to put forward adequate data upon which the process may be judged. Consequently about the only basis of judging these new processes is the past successes and character of the inventor, and of his backers.

If a proposed process gives promise of success, it can usually obtain a trial at the works of some successful operating company. Or it may be taken up by some successful operator who spends his own money developing the process on a working scale, before it is offered to the general public either as a share investment or as an opportunity to participate in the benefits to be derived directly in the use of the process.

Why do not the promoters of these new processes present a series of technical data, giving full information regarding the test runs, such as the amount of supplies required, the cost of power and labor, the capacity and cost of an operating unit, the time required for a cycle of operations, and the recovery or efficiency of the process? As a rule they fail utterly in giving satisfactory data that would enable engineers to judge of the process, even while they are asking the public to subscribe money for shares. The reason why they do not give such data is, of course, that they do not possess it. Experimentation and data cost money, and that is what the process-promoter wants the public to supply, not himself. There is just about as much chicanery in stock-jobbing in wild-cat metallurgical processes as there is in wild-cat mines.

Tuberculosis in Mines

The valuable paper by Frederick L. Hoffman, which is concluded in this issue, draws attention to the importance of a study of the extent to which American miners are subject to silicosis and kindred ailments that are the precursors of tuberculosis. This is a matter that we earnestly commend to the Bureau of Mines.

The micro-organisms of disease are normally held in check by the destructive effect of fresh air and sunlight. In mines there is no sunlight and the air is never so fresh as on the surface. We have heard the dictum pronounced that no victim of tuberculosis should be permitted to go underground. There is much in favor of this to be said.

The reports of labor scarcity in all quarters multiply. The exodus of Greeks and Slavs has intensified the shortage in several districts. Those people are patriotic and in large numbers went home to fight in the Balkans. A train-load of them went from Bisbee alone.

By the Way

The first account of the occurrence of native copper in the Lake Superior district was published in Paris in 1636, says A. H. Meuche, in a publication of the Michigan Geological Survey. The author said: "There are mines of copper which might be made profitable, if there were inhabitants and workmen who would labor faithfully. That would be done if colonies were established."

The following first-aid-to-the-anxious is from a local newspaper, says the *Canadian Mining Journal*, and calls for no comment:

ALUMINUM

Chemist—Aluminum is chiefly manufactured from aluminum ore. It contains 11 minerals and three silicates. The minerals are: Cryolite, corundum, bauxite, diaspore, gibbsite, alunogen, aluminite, turquoise, wavellite and lazulite. The silicates: Kaolin, feldspar and mica.

Important deposits of iron are found in the basin of the Yonne. The principal deposit, according to the London *Mining Journal*, is still unexploited, and is situated between Troyes and Clamecy. In the district of Ioigny the ore is only 10 in. below the surface. The Yonne possesses also important heaps of iron slags called locally *ferriers*, the remains from the smelting operations of the Romans. As the extraction of iron from its ores was at that time very defective, these slags sometimes contain as much as 45% of that metal, mixed with some manganese and silica. These scoriæ form little hills, which have been acquired by German firms, and are transported in long trains to the blast furnaces of Lorraine.

The U. S. Civil Service Commission announces an examination for assistant chemist in radioactivity at a salary of $1800 to $2160 per year. "An educational training equivalent to that required for a Ph.D. degree from a college or university of recognized standing is required, and some practical experience in radioactivity and the rare metals." It is fortunate that "some" is an elastic term. We imagine Professor Soddy, or Lord Rayleigh will not take the examination, as the salary is too large for their needs. Madame Curie is unfortunately ineligible—the examination is for men only. What does "some" mean? Will it be sufficient to have once seen a willemite screen under radio-bombardment? Will the real experts be attracted by an assistancy?

The recent account with reference to the finding of ore on the Sherwood iron property in Michigan, brings to mind the oft-related case of J. R. Thompson, who was formerly manager of the Newport mine of Ferdinand Schlesinger, at Ironwood. The orebody was exhausted, and things looked "very dark." In an effort to find more ore, Mr. Thompson was sinking the shaft into the foot-wall material, contrary to all good practice of the district. At last, the owner got discouraged at finding nothing, and telegraphed to Mr. Thompson to stop the work. Mr. Thompson didn't stop, but drilled and blasted one more round. The result can be guessed from the fact that there a story to relate. The mine now ships a million tons a year, and the valuation of its known ore reserves last year was $8,535,000, making it the most valuable iron mine in the state. It is needless to say that the practice in the district relative to foot-wall material has materially changed.

Probably every reader of the history of chemistry and metallurgy is familiar with the name of Basil Valentine, supposed to have been a Benedictine monk, living in Saxony in the latter half of the fifteenth century. In the supposed works of Basil Valentine are mentioned the metals zinc and bismuth, referred to as "bastards of the metals"; reference is made to the action of oil of vitriol on iron; the doctrine of three elements, mercury, sulphur and salt, advanced; the use of preparations of mercury, antimony, etc., in medicine, advocated; and a remarkably clear treatment of the preparation and properties of many compounds of antimony given. In short, his writings either were apparently drawn from a common unknown source with, or were themselves the source of, the writings of Paracelsus (1493-1541). Doubts on the existence of Basil Valentine have existed almost since the first appearance of his reputed writings. After a thorough examination of all the evidence on the subject, J. M. Stillman, of Stanford University (*Pop. Sci. Monthly*, December, 1912) believes that Basil Valentine was the invention of Johann Thölde, a chemist, owner of the salt works at Franckenhausen, Thuringia, and member of the Chamber of Councillors, which means that a higher place must be assigned Paracelsus, as the advanced chemist of his time.

In probating the will of the New York manager of a well-known trust and bonding company, it was discovered that he hoped to leave a big estate "because he didn't gamble." This estate has been appraised in the surrogate's court of New York at $18,052. The will is quoted as follows: "I owe no bills, but pay cash for all my purchases, and I neither speculate nor gamble, even in the smallest way. It is therefore, more than possible that, unless some unforseen misfortune overtakes me, I shall leave a little something when I die." Ideas as to what is gambling differ. *Life* recently printed a picture of a mother chiding her son for staying up until half past eight at night to play solitaire, remarking that she did not see where he got his taste for gambling. Nearly everyone gambles, and to an extent which he is generally unable to realize. This trust-company official was certainly unable to realize it, for among the securities listed by the appraiser of his estate are 1000 shares of Hawthorne Silver & Iron Mines, Ltd. Paraphrasing an old song: "If that ain't gamblin', then I don' know." As a matter of fact, one can hardly throw a stone into New England without hitting a man who has gambled in mining stock—and usually in a most foolish manner—but if one broaches the matter of interesting them in a legitimate mining operation, they throw up their hands in holy horror and say, "Oh, I don't believe in mining! I never buy mining stock . . . Well, I did once when . . . . . but never again"—unless it is "guaranteed" to give a return of 600% in 90 days.

According to Agricola (Hoover trans.) the duties of a mine foreman were no less arduous, nor his qualifications less stringent, among the early Germans than in the Pennsylvania anthracite fields, for example: "It is he who distributes the work among the laborers, and sees diligently that each faithfully and usefully performs his duties. He also discharges workmen on account of incompetence. or negligence, and supplies others in their places if the two jurors and manager give their consent. He must be skillful in working wood, that he may timber shafts, place posts, and make underground structures capable of supporting an undermined mountain, lest the rocks from the hanging wall of the veins, not being supported, become detached from the mass of the mountain and overwhelm the workmen with destruction. He must be able to make and lay out the drains in the tunnels, into which the water from the veins, stringers, and seams in the rocks may collect, that it may be properly guided and can flow away. Further, he must be able to recognize veins and stringers, so as to sink shafts to the best advantage, and must be able to discern one kind of material which is mined from another, or to train his subordinates that they may separate the materials correctly. He must also be well acquainted with all methods of washing, so as to teach the washers how the metalliferous earth or sand is washed. He supplies the miners with iron tools when they are about to start to work in the mines, and apportions a certain weight of oil for their lamps, and trains them to dig to the best advantage, and sees that they work faithfully. When their shift is finished, he takes back the oil which has been left. On account of his numerous and important duties and labors, only one mine is entrusted to one foreman, nay, rather sometimes two or three foremen are set over one mine." Timber boss, shift boss, mineralogist, mill boss, supply clerk all in one. We wonder what wages they used to pay these paragons.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

Cyaniding at the Dome Mill

I read with interest the article by Mr. Megraw in the JOURNAL of Nov. 23, 1912, describing the milling practice of the Dome Mines Co., at Porcupine, Ont. I notice that the writer seems to consider the ratio between the width and height (8:40) of the Pachuca agitators unusual, but in an all-sliming process such as followed at the above mentioned property it is doubtful if efficient agitation could be obtained with a more shallow, wider tank. F. C. Brown, in giving specifications for Pachuca tanks (*Min. and Sci. Press*, Sept. 26, 1908), placed the ratio between the width and height of standard tanks at 1: 4½ or 5, hence that observed at the Dome plant does not appear to be excessive.

In Pachuca construction there seems to be a general tendency to build a lower, wider tank, either from motives of economy in construction, or from the fact that in many cases the tanks are simply remodeled agitators of some other type. While a tank of this kind will give fair results when working on a pure slime, in all-sliming practice where a large percentage of material consists of fine angular grains of sand, trouble is bound to be experienced in the close packing of these particles. In fact, I believe that the greater part of the difficulty encountered in this system of agitation is due to the reason that the proper ratio of width to height has been neglected in the construction of the tanks.

With respect to the Dome plant, and taking into consideration the all-sliming method in use there, I do not see how any other system would handle successfully such a heavy pulp, containing, as it certainly must, a large percentage of angular, fast-settling particles. Mechanical agitation under the above conditions would entail an extremely high repair cost, resulting from the strain on the machinery. The only alternative to the present treatment, it seems to me, would be to divide the mill product into sand and slime, and treat each separately. Considering the matter from this viewpoint, and from the fact that the time spent in leaching would be offset by a lower power cost, I do not see why the older method would not be successful.

As regards amalgamation, I am quite in accord with Mr. Megraw; it appears to me unnecessary.

J. A. REID.

Kingston, Ont. Dec. 1, 1912.

Is Mining Languishing?

In the JOURNAL of Nov. 23, 1912, G. L. Sheldon takes up under this heading, the discussion of an editorial on this subject, on which there has recently developed a tendency to sound study of the underlying causes.

WHERE THE BLAME IS USUALLY PLACED

There seems, however, to be a tendency to lay the difficulty of prospecting and lack of interest in this, one of the most important stages of the development of our mining industry, at the doors of the General Land Office. I have heretofore referred to this phase of the subject, and will at this time only say that the constant repetition of these charges and insinuations is beginning to tell on the prospector, and only this week, an old and tried prospector came to me with a clipping from one of the local papers, in which reference was made to the Tintic case in Utah, stating but a small part of the subject matter in that case, and using such of the facts as bore out the desired construction to enable it to jump on the department. I pointed out a few of the inconsistencies in the item and quoted matter used, satisfying him of the attempted construction. He had taken the statements at their face value with the result that he had been led to believe that he was "up against it."

Laying aside these features, what is of especial interest in Mr. Sheldon's article is the lack of interest in mining and prospecting. On the last he lays the blame on the Department. But does this account for the lack of interest in hundreds, yes thousands, of *bona fide* prospects, well established, and beyond the influence of some over-zealous ranger, or entirely outside the forest reserves, which are lying idle and in which it is impossible to interest capital? The Department can in no wise be blamed for the conditions that exist with reference to these, wherein then lies the cause?

With such conditions existing and operating against the man with a well established prospect, can the reader guess why prospectors do not go into the hills? Is the Department entirely to blame?

There are many features entering into the cause and producing the effect, and it is a subject well worth discussing. I will ask a few questions that may set some of us thinking.

Can this matter be threshed out in the technical press? Can the mining papers reach the small investor, who stands the best chance with the prospect? Can the effect of the "Course in Muck Raking," which has been given by such papers as *Collier's* and the secular press for purpose of warning the small investor against the wildcat mine and the market gambling, which has, indirectly, severely hit legitimate investment in mining, be overcome except through an educational course in the same papers?

WHY PROSPECTS DO NOT EXCITE INTEREST

What is the effect of the examination of prospects by a certain class of experts, who base their views entirely on the financial features of a mining proposition, who have been brought up in the financial atmosphere of the mining business, and who have never had the practical experience of watching the development of the face of a stope from day to day and learned to know what to expect back of that face; on the development of prospects and the interesting of capital therein?

What is the net result of the employment of this class of men by the larger brokerage houses on their investments? What will be the ultimate outcome of mining and the production of our important metals if this process of ignoring prospects is to continue indefinitely?

I have been repeatedly asked for developed, paying properties, in the past 18 months, and for these there seems to be a real demand. Is this surprising? For gold properties of this description I have referred the inquirers to the Alaska-Treadwell, or the Homestake as meeting their requirements, and this comes about meeting what they demand. Who, with a "developed, paying mine," is looking for financial assistance? Have our mining men become so effete that they cannot consider a "speculative investment," on the advice of competent engineers who are familiar with the district, geology and mineralogy of the prospects?

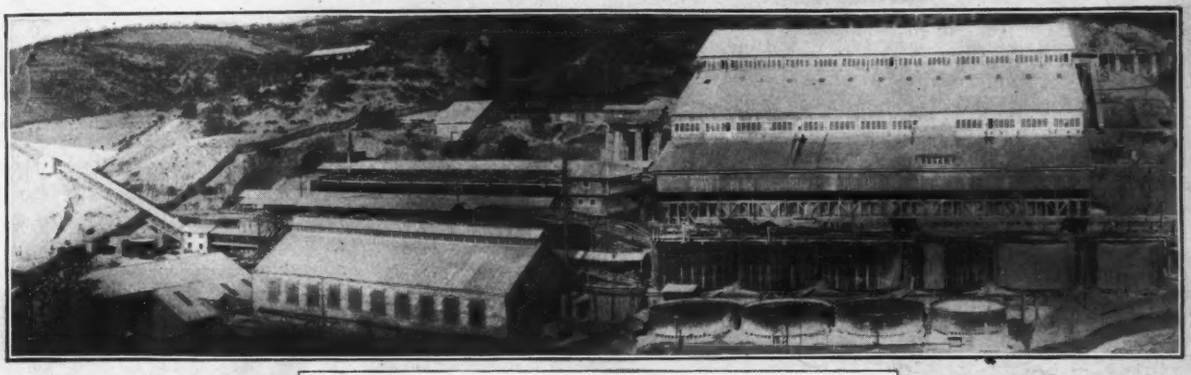
Is the engineer who makes his headquarters in some city office building, at the elbow of the broker and financier, making an excursion, now to Mexico, now to British Columbia, then to Nevada and on to Montana, fleeting trips gaining but a sketchy knowledge of the conditions that enable an expert to give an opinion on a prospect, the kind of "expert" who is going to develop our mineral resources and fill the coffers of his clients?

L. S. ROPES.

Helena, Mont., Nov. 27, 1912.

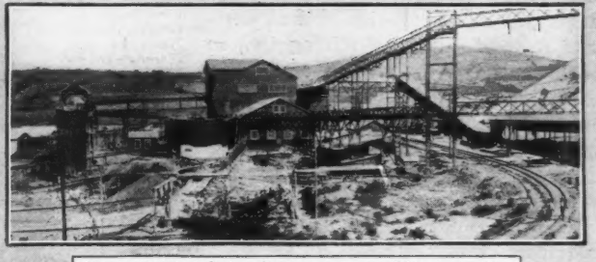
Photographs from the Field

CYANIDE MILLS IN EL ORO DISTRICT, MEXICO



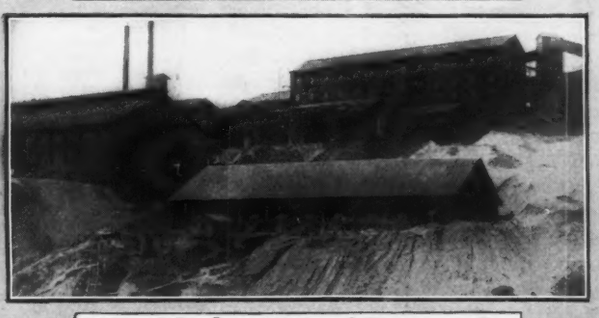
El Cedro Mill of Las Dos Estrellas Mining Co.

Mill of Mexico Mines of El Oro

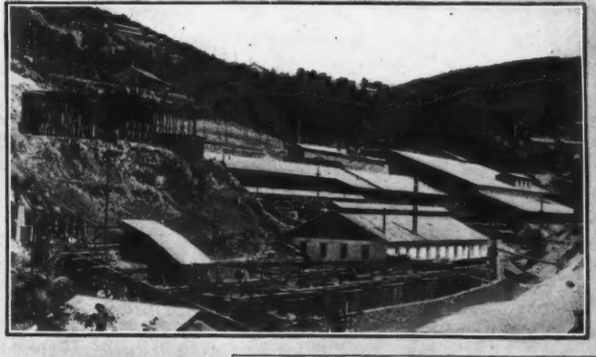


New Mill of the Esperanza Mining Co.

Tube Mills at Esperanza Mill



Mill of El Oro Mining & Railway Co.



Two Views of Mill No. 1 of Las Dos Estrellas Mining Co.

ENG. & MIN. JOURNAL

Chronology of Mining for November, 1912

Nov. 1—First shipment of ore over Georgetown branch of Butte, Anaconda & Pacific R.R. made from Southern Cross mine.—Increase announced in pay of employees at Utah Copper mills, and of engineers, firemen and switchmen on Bingham & Garfield Railroad.

Nov. 5—Striking miners at Cobalt-Townsite mine return to work under old conditions.

Nov. 8—One man killed and five injured by explosion of gas in Simpson-Brooks colliery at Lafayette, Colo.

Nov. 9—Fire entirely destroyed plant of Vulcan Detinning Co., at Sewaren, N. J.

Nov. 10—A mine captain and a miner overcome by gas in a winze in the Casey-Cobalt mine in Cobalt district, Ont., fell into four feet of water and drowned.—Fire broke out in old workings between the Corra and Badger State mines at Butte, Mont.

Nov. 11—Concentrator of Nevada Consolidated Copper Co., at McGill, Nev., running at full capacity for first time since strike, begun in October.—Ten stamps put in commission in new low-grade mill, of Nipissing Mining Co., in Cobalt district, Ontario.

Nov. 12—Two men killed in strike riots at Waihi gold mine in New Zealand.

Nov. 13—Announcement made that the firm of M. Guggenheim's Sons had joined A. C. Burrage in the exploitation of Chuquicamata copper mines, in Chile.

Nov. 14—Smeltery of American Zinc, Lead & Smelting Co., at Hillsboro, Ill., put in commission.

Nov. 15—Miners at Porcupine, Ont., went out on strike in resistance to proposed reduction of wages.—Accident in Horn Silver mine, Frisco, Utah, entombed 12 persons, including four visitors, all of whom were rescued the next day.

Nov. 18—Albert Freeman, Josiah Quincy, and Julian Hawthorne brought to trial for alleged use of the mails to defraud in promoting Hawthorne Silver & Iron Mines Co., Ltd., and other companies.

Nov. 19—First production of sulphur at Bryan Heights, Texas, by Freeport Sulphur Co.

Nov. 24—Twenty-four men killed by explosion of gas in colliery near Alais, in the Department of Gard, France.

Nov. 25—Fifteenth annual meeting of American Mining Congress begun at Spokane, Wash.—Fifty men caught in a cave-in at Barnum mine, Pittston, Penn.; no fatalities, but about a dozen miners seriously injured.—Explosion and fire at Brooklyn Eastern District Terminal, in Williamsburg district of New York, in which 132 tons of Union Sulphur Co. sulphur was stored; several men severely burned.

Nov. 26—Fuel shortage, caused by strike of engineers and firemen on railway controlled by U. S. Steel Corporation, forced 10,000 iron workers out of work in Pittsburgh region.

November Mining Dividends

Mining dividends paid by United States mining companies in November amount to $1,574,596; by metallurgical, coal, iron, and holding companies to $11,421,944; and by Mexican and Canadian companies to $1,343,718.

There were no special changes in dividends paid by the United States companies, but in the Canadian field, Hollinger made a welcome appearance as the first of the Porcupines to pay dividends, with one on Nov. 2 and another on Nov. 30, while it is understood that one will be paid every four weeks hereafter. Canadian Goldfields also paid in this month. Five Mexican companies reported $578,768 dividends, in spite of the "revolution."

United States Mining Companies	Situation	Per Share	Total
Alaska Mexican, g	Alas.	0.30	$ 54,000
Alaska Treadwell, g	Alas.	1.00	200,000
Alaska United, g	Alas.	0.50	90,100
Bunker Hill Con., g	Calif.	0.05	10,000
Bunker Hill & Sull., l.s.	Ida.	0.20	65,400
Butte-Alex Scott, c	Mont.	0.50	50,000
Champion, c	Mich.	1.00	100,000
Cliff, g	Alas.	0.05	5,000
Colo. Gold Dredging, g	Colo.	0.25	25,000
Ellston, g	Colo.	0.02	37,500
Fremont, g	Calif.	0.02	4,000
Frontier, z	Wis.	2.00	2,500
Granite, g	Colo.	0.01	16,500
Golden Cycle, g	Colo.	0.02	30,000
Hecla, l.s.	Ida.	0.02	20,000
Homestake, g	S.D.	0.50	109,200
Miami, c	Ariz.	0.50	332,470
Parrot, s.c	Mont.	0.15	34,477
Stratton's Independence, g	Colo.	0.06	60,750
Tom Reed, g	Ariz.	0.07	63,669
United, c	Wash.	0.01	10,000
United Verde, c	Ariz.	0.75	225,000
Wasp No. 2, g	S.D.	0.02	10,000
Yellow Pine, z.l.s	Nev.	0.02	19,000

Coal, Iron, Industrial and Holding Companies	Situation	Per Share	Total
Amalgamated, c	Mont.	1.50	2,308,319
Cambria Steel,	U.S.	0.62½	562,500
Greene-Cananea, c	U.S.	0.25	618,828
Island Creek Coal	U.S.	0.50	75,000
Internat. Nickel, pfd	U.S.	1.50	133,689
International Sm. & Ref.	U.S.	2.00	200,000
Lehigh Coal & Nav	Penn.	1.00	482,936
Nat. Carbon pfd	U.S.	1.75	78,785
New Central Coal	Md.	0.40	20,000
Penn. Steel pfd	Penn.	3.50	577,500
U. S. Steel pfd		1.75	6,304,919
Warwick I. & S.	Penn.	0.40	59,468

Canadian, Mexican and Central American Companies	Situation	Per Share	Total
Amparo, g.s	Mex.	0.03	60,000
Buffalo Mines, s	Ont.	0.03	30,000
Canadian Goldfields, g	Can.	0.01½	150,000
Coniagas, s	Ont.	0.45	360,000
Greene Con., c	Mex.	0.40	400,000
Hollinger, g	Ont.	0.06	175,000
Lucky Tiger, g	Mex.	0.05	35,768
Montezuma Lead, pfd	Mex.	3.50	35,000
Santa Maria de La Paz, l.g.s.c	Mex.	2.50	48,000
Standard Silver Lead, l.s.	B.C.	0.02½	50,000

Mining dividends paid by United States mining companies making public reports amount to $54,744,870 for the first 11 months of the year, and for American mining, metallurgical and allied companies, to $161,846,126.

The Closing of Pipe in Steel Ingots

By Henry M. Howe*

Three new methods of preventing the formation of pipe in steel ingots, presented at the September meeting of the Iron and Steel Institute, are of great interest. They are described by Doctor Goldschmidt, Sir Robert Hadfield and Doctor Stead.

In Dr. Hans Goldschmidt's process a charge of thermit is pushed down to the bottom of the molten ingot, early in the process of solidification. The metal immediately froths strongly, and then sinks back several inches. Though Doctor Goldschmidt describes this as purely a mechanical process, it seems to be something more. The thermit charge contains both aluminum and iron oxide. We may reasonably suppose that the frothing is due to the reaction of part of the iron oxide on the carbon of the metal in its immediate neighborhood, yielding carbonic oxide, and partly to the mechanical disturbance, such as would be produced by thrusting any rod with or without thermit into the mass.

The sinking down we may suppose to be due to the absorption of part of the aluminum by the metal, because it is to metal which has not been treated with silicon or otherwise to free it from gas that this process is applied.

One readily understands why this process should free the metal from blowholes, just as any other addition of aluminum or silicon should. Such elimination of blowholes, if excessive, leads to the formation of a pipe. From Doctor Goldschmidt's words infer that the ingots which he uses are not piped. If that is the case, one can only infer that he uses a quantity of aluminum so moderate as to lead to an incomplete suppression of blowholes, and thus to leave enough to prevent the formation of a pipe. It is not clear wherein this process would differ in its effect from any other addition of aluminum or of silicon, combined with a stirring of the metal in the mold.

The method of preventing the pipe, described by Sir Robert A. Hadfield, and that of Mr. Talbot, described by Doctor Stead, are characteristically simple and ingenious. Sir Robert is right in implying that the common method of preventing the pipe, puffing up the metal by allowing a moderate number of blowholes to form, so that the metal puffed up is just about enough to fill the pipe, is evidently a makeshift, though certainly a useful one. In fact, it replaces a greater evil, the pipe, with a less evil, the blowholes, and

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their resultant segregation. Any cheap method of closing the pipe in a blowholeless steel is certainly to be welcomed.

I do not overlook the fact that in making a piping steel it is desirable to free it from suspended solid matter, or as Mr. Hibbard calls it, "sonims," by allowing it to evolve gas freely, and adding silicon, aluminum, or other agent for preventing blowholes, and thereby forming the pipe only after opportunity for the escape of gas has been given. This, of course, complicates the procedure.

The method of filling the pipe by retarding the cooling of the top of the ingot has been long and successfully used. The dozzle of Sheffield, the preheated sand sinking head of the steel founder, the gas flame of Riemer, the pouring on of masses of a molten slag, all have been successful. The objection to the common ways of heating the top of the ingot artificially by means of a flame or by coke or charcoal, is that any such operation is likely to carburize or to decarburize the top of the ingot, according to whether the carbon of the fuel used or the air used to burn it has the better chance to work on the metal. Sir Robert's plan of putting a slag buffer between the heating agent and the ingot itself is certainly ingenious and ought to be effective.

Mr. Talbot's method works along the lines of the various compression methods, which close the pipe by squeezing the molten or plastic metal into it as solidification progresses. But Mr. Talbot's method has the advantage over all other compression methods that it applies the cheapest and most effective of our methods of compression, the rolling mill. In particular, Mr. Talbot allows the ingot to solidify part way and then passes it through the rolls in such a way that the still plastic interior of the lower part of the ingot is forced up into the pipe. He thus drives this metal up into the pipe by a passage through the rolls instead of by the longitudinal compression of Whitworth, or the transverse compression of Harmet, Williams, and others.

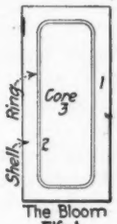
Some words of Doctor Stead's give the impression that Mr. Talbot's method produces some special distribution of the carbon different from the distribution produced by the other methods of compression. It is not clear why this result should follow and an explanation of this point would seem to be desirable.

Sir Robert Hadfield traces the course of solidification in a series of steel ingots by pouring into them at a series of pre-determined stages a small quantity of copper. On sawing the resultant ingot open and etching it, the parts which were molten at the time when the copper was poured in are recognized by the different color there caused by the etching.

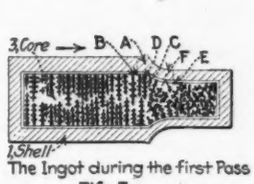
It would appear that the same result could be reached by a small addition of pyrites or of an iron alloy rich in sulphur. This addition would in the same way be confined to the part of the ingot molten at the time of introducing it. Then on sawing the ingot open and etching it by the sulphur printing method of Heyn or Baumann, we could easily see what parts were still liquid at the particular moment at which the sulphur was introduced.

In the case of plain ingots, this information might be had more cheaply by sounding with an iron rod, a method which was used by the late John Coffin.

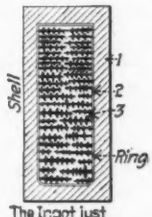
In case of steel castings, Sir Robert's method would appear to offer considerable promise. We sometimes wish to trace the course of solidification, in order to throw light on the problem of feeding and chilling the casting, so as to bring the porous region of final solidification into a harmless position. It might be practicable to throw a good deal of light on these often difficult questions by Sir Robert's method.



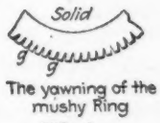
The Bloom
FIG. 1



The Ingot during the first Pass
FIG. 3



The Ingot just before rolling
FIG. 2



The yawning of the mushy Ring
FIG. 4

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EFFECTS OF ROLLING

As between the Hadfield and the Talbot anti-piping methods here put forward, the former would appear to find its natural field in the case of very large ingots, which are not suited for closing up by Mr. Talbot's simple process. For ingots of moderate size and of regular shape, Mr. Talbot's method would appear to have a great advantage in its extreme simplicity. To arrange heating apparatus for heating the top of each of a large number of small ingots severally would appear to present serious administrative difficulties and at the best to be pretty expensive, whereas the pipe of small ingots, and indeed of all but very large ones, could be closed up easily by Mr. Talbot's method.

Since the above paragraphs were written Mr. Talbot's visit and the discussions to which it has given rise enable us to work out a theory of the special distribution of the three segregating elements, carbon, phosphorus, and sulphur, which Mr. Talbot finds. Briefly, the process is applied to ingots which have been well quieted by an addition of aluminum or its equivalent, and hence would not segregate materially if uncompressed. As a result of the compression, while the outer shell of the ingot has about the normal or ladle composition, there lies within it a ring much enriched in the segregating elements, and within that the core of the ingot is correspondingly impoverished.

Evidently the impurities have been transferred from the central core to the intermediate ring. How has this occurred?

At the time of the rolling the outer crust is distinctly solid, but the core has thus far solidified only slightly, so that it is a wholly indoherent mass of pine tree trunks and branches, with the space between filled with still molten metal. The ring which is finally found enriched in the segregating elements is at this moment in that mushy stage in which the degree of cohesion through it is appreciable, decidedly greater than that of the wholly incoherent core, is yet too little to enable the metal to elongate along with the solid outer walls during the rolling. As a consequence this slightly coherent ring cracks open in numberless minute cracks.

At the same time the solid walls and the ring are pressed down by the rolls upon the incoherent core. Of this core the pine tree trunks and branches are the purer metal, and the still molten ground mass between them is relatively impure, as a necessary consequence of the normal course of solidification. Under these conditions, the opening of the crevices in the ring converts that ring into something like a mass of blotting paper, ready to soak up from the core the still molten impure parts of that core. Thus comes the transfer of the impure material from the core to the ring, pass after pass.

The remarks of Messrs. Kenney and Stoughton have shown the essential conditions, and I have done little more than to supply some missing links and put the whole into coherent form. Having done this, I believe that this explanation is that which Doctor Stead has conceived, though I was unable to follow his remarks in the form in which they reached me.

Wells' Nickel Extraction Process

A recent patent of Horace L. Wells, of New Haven, Conn. (U. S. pat. 1,044,316), provides for the extraction of nickel from nickel-copper matte by means of hydrochloric acid. The matte is pulverized to 60 mesh, or finer, and treated with 18 to 25% hydrochloric acid at a temperature between 110 and 212° F. The first solution is then decanted or filtered off, and the residue is again treated with further amounts of acid. This is done be-

cause one treatment will not extract all the nickel, no matter how long continued or how strong the acid. The acid used in the second treatment is not exhausted and is available for use as the first leach in treating a succeeding batch of nickel matte. The matte is agitated during this treatment. The solution of nickel chloride thus obtained is treated for nickel or for nickel salt, as provided for in the various other patents of Tom Cobb King and H. L. Wells.

Metal Tariff Probabilities

WASHINGTON CORRESPONDENCE

Chairman Underwood, of the Ways and Means Committee, has made it plain that he intends to reintroduce and report to the House of Representatives the original Underwood steel and metals tariff bill in very much the same form in which it was expressed last winter. Mr. Underwood has determined to hold hearings in January and it is stated that full opportunity will be given to everyone who has anything to say. But it is also evident that there is a feeling among Democrats that whatever may be said will be largely superfluous and rather intended to placate public opinion and prevent the statement from being made that final action was taken without notice or information, than it will be for the purpose of getting actual new data for use in reframing the measure.

Of course, this does not mean that there are to be no changes in the steel and metals bill; on the contrary, a good many Democrats were quite thoroughly convinced that a number of the rates in the bill had been erroneous. A few amendments made in the Senate were accepted when the bill came back to the House last summer, and more would have been, but the debate in the Senate had not produced any very strong feeling in favor of drastic revision of the terms of the legislation. There are some rates in the bill that are generally considered both by Democrats and progressive Republicans to be too high. Included among these are the rates on all of the heavy iron and steel products and those on lead and zinc as well as on other metals. Some others are considered too low, notably those on certain types of machinery. So it is quite probable that there will be rather extensive changes but none, it would seem, that will be likely to make a real alteration in the general level fixed by the bill of last year. Indeed it seems probable that whatever change in that level is allowed to take place will be in a downward direction.

Lead and zinc interests not affiliated with the American Smelting & Refining Co. have already indicated a determination to take an active part in the work of Congress this winter and to demand free trade in these articles. They point particularly to the present smelting-in-bond provisions as being indefensible and consequently deserving of abolition or if a duty is retained, of serious modification. They have filed briefs with the Ways and Means Committee and expect to bestir themselves actively. The same has been done by those who now profit from the duties on lead and zinc, and a combination of Missouri, Colorado, Idaho and other interests has apparently been effected. The Ways and Means Committee will have to meet this opposition in the Democratic party along with much other antagonism to the bill.

It is already evident, however, that if extensive changes are to be made in the metals bill they will have to be made in the Senate and very largely with the consent of the new President. There is no difficulty in recognizing that the House Democrats cannot well afford to put themselves in the position they would occupy if they were to alter the metals bill drastically in the direction of protection. Whether in consultation with members of the Senate they will consent to a readjustment that will permit the latter body to raise rates all around or not, is a question that is now the subject of very interested discussion. Undoubtedly there is a strong group of senators, including some from the old-line Democratic group, some Progressives, and, of course, a number of old-line Republicans who will do their utmost to raise the rates when the bill goes to the Upper Chamber. Nothing has as yet been decided by the Democrats in the House as to whether they will or will not permit the appointment of a joint committee in conference representing the two Houses which shall reshape the tariff bills this winter and thereby assure sympathetic committee treatment for the House bill when it goes to the Senate. The chances, however, are against any such outcome.

General Petroleum Co.

The General Petroleum Co. is increasing its activities both in California and Mexico. In California, it has 26 drilling outfits at work and besides the building of a 185-mi. pipeline, and the proposed acquisition of the Union Oil Co., mentioned in the JOURNAL of Nov. 30, it is now completing the details of the absorbtion of the Continental Petroleum Co. of America, by exchange of bonds and stock for the U. S. and Mexican properties of the latter company.

The General Petroleum Co. owns 18,000 acres of oil land in Mexico and 13,000 acres in California. Through the General Pipeline Co., of which the General Petroleum owns 75% of the capital stock, an 8⅝-in. pipeline, 185 miles long, is being built at an expense of $4,000,000 for the line, tankage, pumping stations, terminals, etc. The pipeline will have a deep-water terminal at San Pedro and will serve various fields, extending as far north as the Lost Hills district. The line is to be completed in March, 1913, and is expected to have a capacity of 25,000 bbl. per day.

The General Petroleum Co. owns a half interest in a new system of refining and plans are being made to erect a refinery at the pipeline terminal, where a storage capacity of 2,000,000 gal. will be provided. Waterfront property has been acquired near Tampico, Mex., and it is the intention eventually to duplicate in Mexico what is now being done in California.

David White

David White, who was in November appointed chief geologist of the U. S. Geological Survey to succeed Waldemar Lindgren, has been connected with the

DAVID WHITE

Survey for 26 years, having joined its force just before he graduated from Cornell University. His chief work for a number of years was in the paleontological division, in which his studies and reports gained for him a high reputation. More recently his familiarity with the coal-bearing formation of the Eastern coal fields, gained in the study of the fossils, and technical knowledge of coal, gathered in the course of investigations of their microscopic composition, and of the problems concerning the origin of coal, led to his choice as section chief, charged with the economic work of the survey in the Eastern coal, oil and gas fields. Mr. White is a member of several scientific societies, including the National Academy of Sciences, and is president of the Paleontological Society and vice-president of the Geological Society of America.

Trunk Channels as Ore Localizers

By Charles R. Keyes*

Trunk channels of the vadose zone are lines of ore removal rather than of ore deposition. Principal ore localization in the profound region is near the bottom of main channels through which vapors and heated waters are expelled from magmatic masses.

*Consulting engineer, Des Moines, Iowa.

Although ore deposits so often occur along the restricted lines of freely flowing groundwaters, it does not necessarily follow, as lately we have been so commonly led to believe, that the presence of orebodies in such situations is solely due to the long continuance of unusually great volumes of passing waters. Ore localization is almost invariably determined by other and entirely unrelated factors. As recently and conclusively shown, only under special geologic conditions do any parts of trunk channels become commercially valuable ore repositories. As general *loci* of ore deposition, altogether too much importance appears to have been attached to these subterranean streams. The conception is largely a purely theoretical one, and has its foundation in certain analogies drawn from the field of general rock metamorphism, rather than from actual observations in mines.

Descending Meteoric Waters Not Ore Depositing in Depth

Practical consideration of the relations existing between ore deposition and groundwater circulation indicates that ascending and descending movements are not the features to be particularly contrasted. Only in a limited sense is the distinction of any real service. The fundamental comparison to be made is between the trunk channels of the vadose zone and those of the profound region. Soon after passing below groundwater level, descending meteoric waters do not appear to be notably ore depositing. Only in exceptional cases are ore materials probably precipitated from such waters after they have attained considerable depths and have begun to travel upward. Artesian waters derived from the general groundwater circulation seem also to be remarkably free from metallic constituents On the other hand, metalliferous ascending waters appear to be invariably associated with certain phases of volcanism and orogenic movement. De Launay, especially, has lately emphasized the idea of a close genetic relationship between orogeny, petrology and metallogenesis.

The commoh notion that the main channels of groundwater circulation are vertically disposed and that in some places the water currents are ascending but in others descending, seems true only under certain restricted conditions. On the whole, the trunk channels of the profound zone that are ore depositing are probably vertical or nearly so, yet relatively few of them are productive of workable orebodies. It is another problem whether such ascending waters carrying depositable ore materials have been expelled from deep-seated magmas, which are cooling, or whether they are really meteoric waters which have been heated in the course of their subterranean travels. The recent exhaustive arguments of Brun and of Stutzer for the anhydrous character of magmatic emanations appear to afford no adequate explanation of the presence of water in many silicate minerals of plutonic rocks, nor of the peculiar relations existing between such rocks as massive granites, pegmatitic dikes and quartz veins. My own opinion leans towards the idea that orebodies deposited by ascending waters are derived largely, if not entirely, from juvenile waters; rarely, if ever, from heated meteoric waters. Nowhere, so far as the profound zone is concerned, have I ever been able to find satisfactory evidences of the lateral secretion of ore deposits, even in the broadest sense of the term.

The chief diversion of vadose waters in a horizontal direction is productive of two noteworthy results: A large gathering ground for diffused ore materials in decomposing rocks is drawn upon; and these ore materials are soon directed along restricted paths and, without great losses, are often carried great distances.

Vadose Ore Formation Comparable to Wilfley Table Concentration

Assuming as fact, as Posepny has so well urged, that the groundwater level is generally an inclined plane, vadose waters are in consequence continually moving down this slope, sometimes fast through open crevices in the rocks, sometimes slow through almost impermeable masses. In its larger aspects, vadose ore formation is comparable in a way to the concentration of finely crushed ores on the Wilfley table, the uprising of mountains tilting both the former slight incline of the groundwater table and the strata, so that all meteoric waters falling upon the area are directed along certain definite lines or narrow troughs. Whenever geologic structures assume the character of cross folds, faults or other obstructions to the free movement of subterranean circulation, impounding conditions occur and the metallic loads in solution are at once precipitated as ores. The tectonic crossbars are thus the analogues of the riffles of the Wilfley. In comparison with the precipitation of metallic minerals through impoundment of groundwaters, all other methods of vadose ore deposition appear insignificant.

In some regions, as the Ozarks for instance, it has been shown that trunk channels are lines of rapid ore solution and removal rather than of ore deposition. In reality, the Ozark country is a tract which is now being rapidly depleted of its ore materials. Only when the main channels of groundwater flow become clogged in some way or other do orebodies form in them. The fact is well supported by other than mere isolated observations. To this more than anything else is it probably due that ores are not deposited everywhere evenly in the vadose zone. It is likely that it is a fundamental law of groundwater movement that only where the current is interrupted, or stagnation prevails, are ore materials precipitated.

Descending Waters Deposit Mineral Content at Groundwater Level

The necessary consequences of a theoretical consideration of circulatory groundwaters have never been critically compared with the recorded observations on the distribution of ore materials in mines. Of course, part of the waters moving horizontally in the vadose zone often issues at the surface of the ground as springs, and becomes mingled with the surface waters. At groundwater level, or slightly below, the portion passing downward into the profound region at once drops a large proportion of its metallic salts to form the bonanza ore zone. The part carried farther downward must mainly enter into combinations, which are not ore forming. Except at the top of the profound part of such channels, few or no orebodies are deposited. When these downward moving waters begin to ascend again, under ordinary conditions, they are probably entirely free from the common metals in solution; and on account of these very conditions they are not likely to take up other metals on their way up to the surface again. The nonsoluble character imposed during the passage of metallic combinations through the profound region, doubtless remains so under all ordinary increases of temperature which are likely to be met.

Ore-forming Tendencies in Vadose and Profound Regions Directly Opposed

On the other hand, ascending juvenile waters appear to part with all or nearly all of their ore-forming materials long before they reach the groundwater line and the confines of the vadose zone. The *locus* of principal ore deposition appears

to be near the bottom of the main channels, through which the vapors and waters find exit from the magmatic mass. Only long afterward, when these orebodies are brought to the surface through the general erosion and lowering of upraised mountain belts, are they made accessible to man.

Since, in the one case, there is notable rock solution, and in the other rock cementation, it follows that the ore-forming tendencies of the trunk channels of the vadose zone and those of the profound region are directly opposed. In the light of the most recent tests regarding the *locus* of maximum ore deposition, the theory of trunk-channel localization of ores, as advanced by Van Hise and others, needs to undergo considerable modification before it can be made acceptable. If, under normally wet-climate conditions, the greater part of vadose trunk channels must be considered as lines of ore depletion rather than of ore enrichment, the subject assumes unusual interest, since it is considered that in arid tracts of the globe the vadose zone, as recently shown, attains enormous thickness and acquires such vast importance in mining.

Mining and Metallurgical Industries in Spain

In a volume of statistics regarding the output of Spanish mines, the president of the Official Council of Mining calls attention to the great mineral wealth of Spain and to the large number of mineral deposits which remain unworked, and suggests four methods by which the government could aid the development of this source of national wealth. This document is dealt with in a British diplomatic report, by T. Lyons.

Suggested Aids to Mining

The methods suggested by the president are:

(1) Legislation to prevent speculators without capital impeding the development of rich deposits by obtaining concessions and refusing to part with them, although they themselves are unable to work them.

(2) That the mining industry should be "freed from the innumerable charges and taxes to which it is at present liable under so many headings." According to the report all companies engaged in this industry are directly or indirectly affected by the following taxes: *boca de mina*, a tax of 3% on the value of raw material at the pit's mouth; transport tax, a tax of 5% on freight charges; export tax; shipping tax, a tax per ton on goods at the port of disembarkation; industrial taxes; import duties; property tax, a territorial contribution on real property; a tax of 1 per 1000 on the total capital employed by certain categories of foreign companies in Spain. During the last year no new taxation has been added to this formidable list but an attempt has been made to fix, at a sum greatly in excess of that previously determined, the capital of certain foreign mining companies for the purposes of the 1 per 1000 tax. Capital taxable under this heading is, failing agreement between the mine owner and the government, fixed by an expert appointed by the ministry of finance, and no appeal is allowed against the decision.

(3) That the state should make to mining companies monetary grants to be spent for such purposes as experimental borings in coal-bearing strata, drainage, pumping, etc.

(4) The improvement of transport facilities both by land and sea.

The president of the mining council considers the lack of these facilities to be the chief factor which retards the development of Spain's mineral wealth. He therefore advocates the construction of light railways, the equipment of ports with modern facilities for loading and unloading ships and the addition to the Spanish mercantile marine of vessels of large tonnage capable of competing with foreigners in regard to freight.

Statistics for 1909

Statistics regarding the output of Spanish mines are leisurely compiled and

STATISTICS OF SPANISH MINES FOR 1909

Substance	Productive Concessions	Hands Employed	Production Tons	Value at Pit's Mouth Pesetas
Coal	592	21,956	3,662,573	47,345,000
Anthracite	13	1,515	198,302	3,004,000
Lignite	58	1,494	265,019	3,269,000
Iron	503	36,804	8,786,000	45,503,000
Iron pyrites	7	842	258,931	1,215,000
Mercury	16	1,373	37,397	5,082,000
Sulphur	8	602	21,749	149,000
Copper	125	25,448	2,955,258	35,407,000
Manganese	6	203	7,826	134,000
Lead	184	14,233	137,049	18,780,000
Argentiferous lead	133	10,138	161,496	30,619,000
Zinc	84	4,864	163,521	7,388,000
Wolfram	3	118	129	64,000
Salt	35	346	23,044	378,000

therefore, Mr. Lyons is content to give the 1909 table shown herewith.

In the second table is given the production in 1909 of factories engaged in treating minerals raised from Spanish mines.

The tables show a slight decrease in the production of the more important minerals, including iron, coal and copper. There was, however, an increase of 994 shown in the total of 120,872 men and women employed at the mines. The women, all of whom were employed above ground, numbered 2508. More factories were at work, employing 2104 more persons. This output was greater with regard to iron, copper, mercury, coke, patent fuel and portland cement, but the production of lead, zinc and salt showed a decline.

In all classes of mines and metallurgical factories the total number of men and women employed in 1909, was 156,782, of whom 9½% received some form of injury. New mining regulations issued in 1910 included a more rigorous system of inspection. Statistics (for mines only) show that a great improvement has been brought about. Deaths have been reduced from 256 to 180 during 1911, and serious injuries from 282 to 174 in spite of the tendency toward increase of the total number of employees. Two years will elapse, Mr. Lyons says, before statistics appear regarding the output of Spanish mines during 1911.

PRODUCTION OF SPANISH METALLURGICAL WORKS IN 1909

Substance Produced	Factories Working	Hands Employed	Production Tons	Value Pesetas.
Patent fuel	13	562	478,690	6,735,000
Mercury	6	710	1,364	9,407,000
Cement	66	2,140	471,909	10,108,000
Zinc	1	431	9,625	6,313,000
Copper—				
Precipitate	..	...	16,547	19,843,000
Blister copper	21	4,262	17,519	28,706,000
Sulphuric acid	..	...	8,640	864,000
Iron—				
Cast iron	..	...	428,622	8,798,000
Malleable iron	..	...	24,187	8,125,000
Steel	16	11,446	161,261	19,529,000
Rolled and partially manufactured steel and iron	..	...	218,409	34,897,000
Coke	18	261	500,909	15,060,000
Silver	4	33	143,403*	12,843,000
Lead	19	1,689	136,441	43,217,000

*Kilograms.

Of the nine articles which form the Spanish export tariff, five are concerned with minerals. The duties levied are as follows: Galena and other lead ores, 1.5 pesetas per 100 kg.; argentiferous lead ores, those containing more than 30 grams of silver to every 100 kg. of lead, 1 peseta; iron ore, 2 centimos; copper ore containing more than 2½% of copper, 16 centimos; copper matte, 2 pesetas. The quantity of metals exported in 1911 was as follows: Pig iron, 38,962 tons; copper precipitates, 13,352 tons; copper ingots, 16,896 tons; mercury, 1463 tons; argentiferous lead in pigs, 48,158 tons; ordinary lead in pigs, 124,619 tons; zinc in pigs and sheets, 2563 tons.

Spanish imports of coal have remained almost stationary at slightly over two million tons during the last three years. Out of a total importation in 1910 valued at 64,600,000 pesetas, 62,600,000 pesetas worth was of British origin. Consumption of coal is increasing in Spain, and is almost entirely provided for by the development of new collieries.

Nearly 70,000,000 gallons of mineral water were sold in the United States in 1911, according to the U. S. Geological Survey, the value of which is placed at $7,875,373. New York led all other states in the quantity of water sold (10,245,261 gal.), but the Wisconsin output had the highest value, namely, $955,988, or an average of 17c. per gal. The average value of the domestic water at the springs was 10.7c. per gallon.

Details of Practical Mining

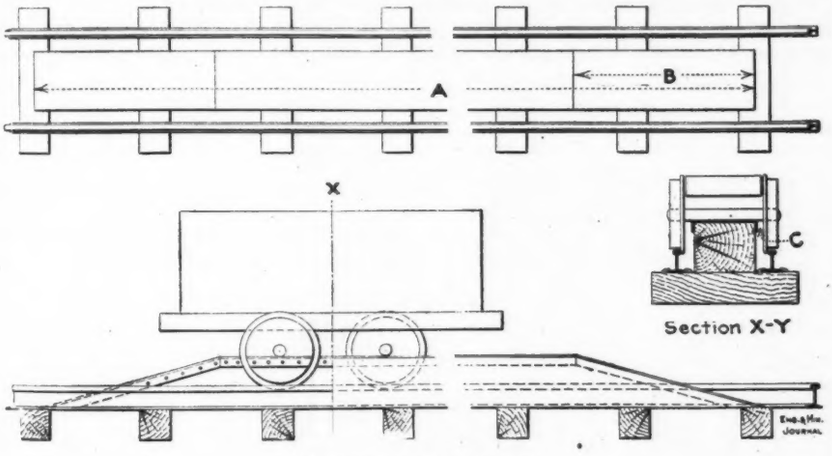
Accounts of Useful Ways of Doing Many Things in the Day's Work

Device for Retarding Speed of Cars

BY JOHN T. FULLER*

The accompanying engraving shows the essential details of a simple device for checking or retarding the speed of cars used at the diamond mines in Kimberley, South Africa.

It consists of a platform built of one or more pieces of timber, bolted or spiked to the ties between the rails, with a slope at each end as shown. Over this platform wrought-iron or steel plates ⅛ or ¼ in. thick are spiked, bolted or screwed.



KIMBERLEY CAR CHECK

The height of this platform above the rail is just sufficient to raise the wheels of the car free from the rail when the axles come in contact with the platform. The car travels the length of the platform on its axles, its speed being gently and gradually checked to any degree desired depending on the original speed and the length of the platform.

The width of the platform will depend on the width *C* of the journal boxes. The length of the platform must be determined by experiment for each case; but this is quickly and easily done. The length *B* of the inclined portion of the platform is usually about three feet and I have used at different places platforms with the length *A* from 10 to 25 feet.

When once properly adjusted this car check will be found not only simple and economical but absolutely automatic and indestructible under the roughest usage. This device can, of course, only be used where the car axles are free to revolve. Contrary to expectation, I have never experienced any trouble with bent axles by using this form of check.

*Consulting engineer, 505 Park St., Honesdale, Penn.

Automatic Belt Tightener

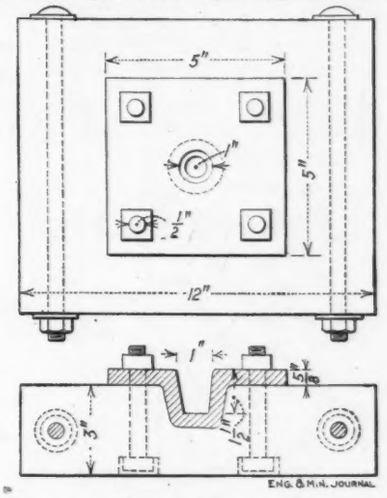
BY J. R. MCFARLAND

A unique automatic belt tightener and incidentally a new use for worn out stoping drills has been devised by C. C. Griggs, superintendent of the Uncle Sam Mining Co., at Eureka, Utah. In changing a straight-line steam-driven air compressor to motor-power belt drive, the pulley of the compressor was placed on the shaft between the two narrow-rimmed fly wheels. On account of the proximity of the cylinder, the pulley had to be smaller than good practice would allow.

The necessity of having the belt tight on high pressures was apparent. A wooden frame was erected about midway of the belt. On each of the perpendicular posts a feed cylinder from a worn-out stoper was placed. To the bottom of the feed pistons a shaft bearing an idler was attached with the idler bearing directly on the belt. The tops of the feed pistons were connected with the air line to the receiver. As the air pressure rises in the receiver and the strain becomes greater on the belt with an increased tendency for belt slippage, the air pressure working on the stoper feed pistons holds the idler tightly against the belt and as the air pressure in the receiver drops the tension on the belt is automatically released.

A Steady Tripod Set-up on Loose Rock

In certain classes of mining, especially with some types of underhand stoping, and where the orebody is too wide for a column, a tripod set-up for the drills is frequently necessary. Often it is not possible to place the tripod legs on solid rock and a yielding set-up results which interferes with good drilling. When such a set-up is necessary on a pile of broken ore, several expedients are employed to steady the drill and distribute its weight over a large area. In some Missouri mines the tripod is set on old car wheels; these are heavy to handle and if mixed with the ore might cause serious delays, especially if gyratory crushers were used. In Butte wooden blocks are employed, but unless they are at least five inches thick or shod with iron they are easily split by the sharp ends of the tripod leg.



SHOE FOR TRIPOD LEG ON BROKEN GROUND

A device used at the Cleveland-Cliffs Iron Mining Co. in Michigan, consists of a 10x12-in. piece of three-inch oak, shod with a five- or six-inch square of ⅜-in. scrap iron. The shoe, which is fastened to the block by four ½-in. carriage bolts, has a depression about one inch in diameter and 1½ in. deep, to receive the tripod leg.

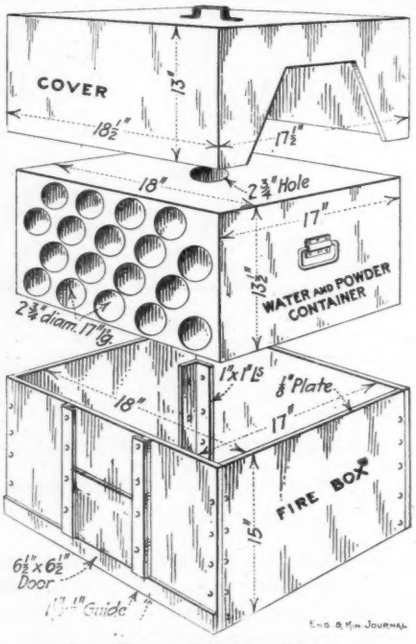
To prevent splitting the block is bound together at each end by a ½-in. bolt, as

seen on the accompanying drawing. So good a set-up can be obtained with this device, that the mine captains say the footage drilled depends more on the men at the machines than on whether a column or tripod set-up is used. Other things being equal a man with a tripod can drill only about two-thirds as much as with a column.

The miners often ride the tripod while drilling; much of the jar is eliminated if a plank is put in crossways through the legs, allowing the operator to sit or stand on a spring-board.

Hot Water Powder Heater

The powder heater shown in the accompanying drawings is used throughout the iron mines at Mineville, N. Y. Dupont or Potts powder of from 30 to 45% strength is generally used and, due to the low temperature in the mines even during the summer months, the powder must be thawed. However, some of the mines do use a certain percentage of the non-freezing powder. The heater shown has a capacity of 108 sticks, each flue accommodating six sticks of 1⅛ x 8-in. powder. The fire is first kindled in the firebox, the water container is placed over the firebox, resting on corner angles, and then the cover is slipped over the water container. The latter is 17x18 in. by 15 in. high and made on the principle of a return-tubular boiler. Flues, 18 in number and 2¾ in. in diameter, are fitted in two opposite faces of the container. Water is poured in the top of the container until it is well above the top row of tubes. After the water has been heated to a temperature which the hand will bear, the container and cover are removed to a safe distance from the firebox and the fire completely extinguished. The cover is then removed and the flues are filled with the sticks of powder and the cover replaced. In a short time the powder will be sufficiently soft for use.



HOT WATER POWDER HEATER

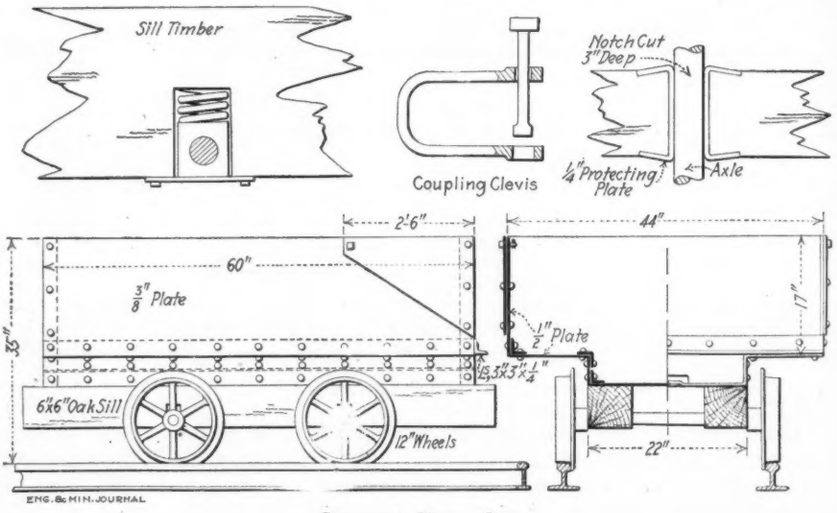
Desloge Mine Car

The mine car used by the Desloge Consolidated Lead Co., in southwestern Missouri, is shown in the accompanying illustration. The car is of the long, low type, which has found favor in the Lake copper and iron districts, due to the ease and rapidity of loading. This is especially true when the ore is to be loaded directly from the floor of the stope.

The Desloge car stands 33 in. above the rail, it is 5 ft. long, 44 in. wide and has a wheel base of 24 in. The body of the car is made up of ⅜-in. plates. It has been found that by using a car composed of several plates, as seen in this design, wrecked cars are more easily repaired than when fewer and larger members are employed. All the plates are cut to the correct size at the mill, being assembled and riveted at the mine, using ⅝-in. rivets, spaced 6 in. center to center, and ¼x3x3-in. angles. The drawbars are formed by bending ⅝x2½-in. iron straps back on themselves and punching them to receive the coupling pin or hook.

The axles, which are 2 in. square, have collars immediately behind the wheels which prevent any side play. An unusual feature of the car is that the axles can move up and down in iron-lined notches cut in the truck timbers, 2 in. wide and 3 in. deep. This enables the wheels to follow any vertical inequalities of the track in much the same manner as do the Joplin bucket trucks. In order to make the car itself ride more easily, coil springs are fitted in the notches between the axles and the truck timbers. The longitudinal timbers project 3 in. at both ends and act as bumpers. The car body being fastened rigidly to the trucks, tipples are used in dumping; the cars have squirrel-cage doors, which permit the use of the spear tipple.

The link-and-two-clevis coupling arrangement is generally used. In order to prevent pins from being lost, the upper hole of the clevis is made smaller than the lower one, the pin is put through the upper hole and upset just enough to prevent it being pulled back, but still is small enough to go through the lower hole easily.



DESLOGE MINE CAR

Sheave Wheel Lining

BY G. L. SHELDON*

The rubber lining used to lighten the wear in sheave wheels and to keep wire cable from slipping, frequently cuts out when the wheels are run at short angles. The following method of relining the wheel will be found satisfactory after all of the old pieces of rubber have been removed.

Unwind an old piece of large-size manila rope and wind into the sheave wheel a single strand of the rope, applying a steady tension. As each layer of rope is run on the wheel saturate it with pine tar. Continue the operation until the lining reaches the desired thickness. A liberal allowance of tar should be applied to the last layer of rope and the wheel should be allowed to stand from 12 to 18 hours before using. This lining serves just as well as rubber and is far cheaper. Coal tar or melted pine-pitch gum may be used in place of the pine tar.

Blasting gelatine consists of nitroglycerin in which 10% or more of guncotton has been dissolved and camphor added.

*Box 135, Ely, Nev.

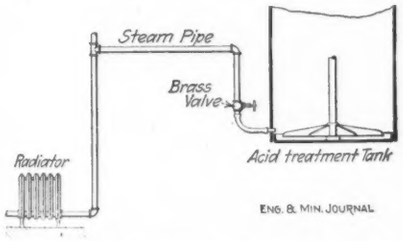
Details of Metallurgical Practice

Records of Experience in Ore Dressing, Cyaniding and Smelting

A Peculiar Loss of Precipitate

At one of the large mines where the cyanide process is in use, the arrangement of the tanks for acid treatment is essentially as shown in the accompanying drawing. The tank has an agitation arrangement and the method of heating the mixture, in order to expedite treatment, was by taking steam from the heating system and introducing it into the tank near the bottom.

After this arrangement had been in use for some time, a shortage of product was noticed which continued and became more pronounced. As the acid treatment was in charge of one man and the refining and melting in charge of another, there ensued a period of argument, each operator endeavoring to unload the blame on the other, meanwhile the shortage grew. After this had continued for some time the two men



ARRANGEMENT WHICH CAUSED LOSS OF PRECIPITATE

commenced an investigation and soon found that the steam-heating device had caused the trouble. The siphoning effect on the acid liquor after the steam had been turned off resulted in eating out the brass valve and the liquor and precipitate worked back through the heating system, the pipes and radiator being found packed full of high-grade gold precipitate.

After this discovery, the heating was done by a pipe and hose connection, so that after the heating had been carried far enough the hose could be pulled out of the tank and no damage could result.

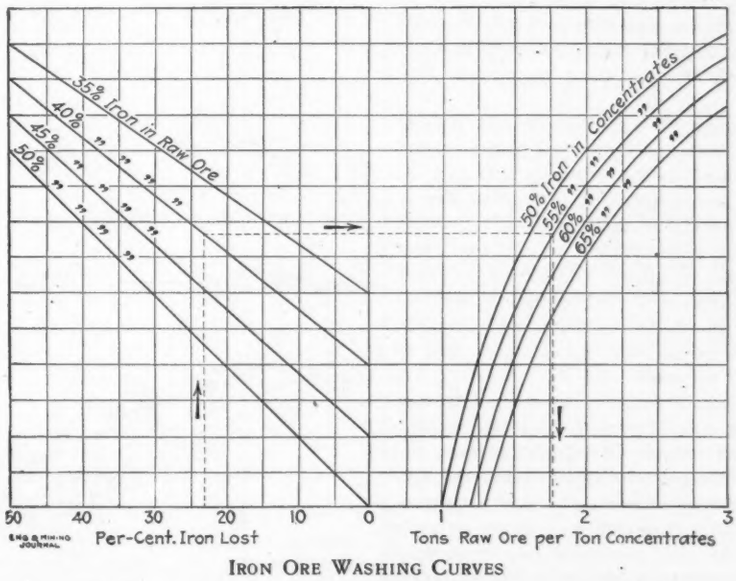
Some time ago, an installation of a Knudsen pyritic-smelting furnace was made at the United Verde copper works at Jerome, Ariz. On account of troubles connected with ground settling, no tests have ever been made; the management expects later to give the furnace a trial.

Iron Ore Washing Calculations

BY GEORGE C. OLMSTED*

The accompanying illustration shows a set of curves which may be used in connection with an iron-ore washing plant. Without calculation they show how many tons of raw ore of given iron content, are needed to produce one ton of concentrates of required iron content when a certain amount of the iron is lost.

For example, a raw ore containing 40% iron is to be washed so as to produce 55% ore; in the process 23% of the iron is lost. How many tons of raw ore are needed per ton concentrates? Follow up the ordinate from the percentage of iron lost, to the line showing per-



IRON ORE WASHING CURVES

centage of iron in ore, then across along the abscissa to the curve giving the percentage of iron in the concentrate. The length of this abscissa (1.78) is the tons of raw ore required.

Aids to Launder Efficiency

Flow in launders is aided if the corners are filled with triangular strips of wood, and that portion wetted by the stream of pulp lined with some smooth, abrasion-resisting material such as rubber belting, ("Rand Metallurgical Practice," Vol. I, p. 104). More recent plants on the Rand have put down concrete launders on the solid ground where possible. When the launders are overhead, U-shaped sheet-steel, concrete-lined launders are erected. In each case the wetted surface is finished off with cement to give a smooth surface.

Bends where unavoidable should be wide sweeping and given additional fall, and should not be placed too near in front of a distributing point. Distribution immediately after a change in direction of the pulp is always unsatisfactory, as unequal consistency of pulp in the sub-divisions results.

*Mechanical engineer, Virginia, Minn.

The Froth Flotation Process

In discussing flotation processes before the Institute of Mines and Metallurgy, H. L. Sulman says that an essential factor in a successful treatment is obtaining a thick substantial or matted froth, necessary to support the coarser mineral product. If, through lack of observance of certain simple conditions, it is allowed to become skinlike, it would obviously not afford the same chance for retaining these. In the last float chamber, where, owing to the growing depletion of the pulp in minerals, the froth necessarily becomes less bulky, the free water flotation surface is therefore often reduced by introducing deflecting or crowding boards. These, by confining the froth within a smaller area, enabled it to retain its normal thickness.

He also remarked upon the simplicity

of the froth-flotation process. By a mere vigorous agitation of ore and water and the addition of a minute proportion of oil, in the case of the Kyloe Copper Co., only two-thirds of a pound of crude eucalyptus oil per ton of dry ore treated, costing only 10¾c., froths were produced which carried over 80% of the total mineral as a concentrate, assaying over 20% copper, and this from an ore carrying only 3½% copper. Such a recovery was by no means exceptional and might be regarded as representing average work on clean chalcopyrite ores. From poorer copper ores they were obtaining recoveries approaching and sometimes exceeding 90% in concentrates carrying 22 or 23% of metal.

The flotation plant was such as could be constructed anywhere by any good mine carpenter, being mainly of wood. The castings required were merely those for bearings and the impellers of the agitator spindles provided for each mixing box. The process is by no means a delicate one and requires no intricate adjustment or highly skilled supervision; but certain conditions are naturally demanded. These are, that the ore pulp sent to the flotation plant should be of fairly uniform consistence, say four or five parts of water to one of ore, and the pulp delivery should be uniform as to flow, and broadly so as to mineral content.

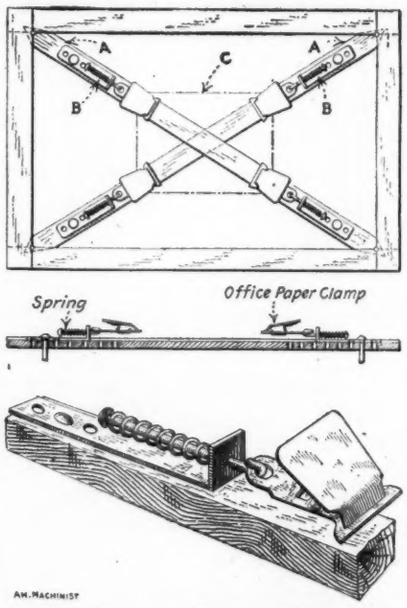
Obviously if either factor was subject to wide variation from time to time, plant adjustment would be required and be varied accordingly. It is also necessary that crushing should be such as would yield the best results for the particular ore under treatment, and that the driving power applied to the agitation spindles should be uniform, these must not be allowed to race at one moment and to drop off the next.

The froth-flotation process is now treating a wide variety of sulphide ores, zinc-lead, copper, silver, molybdenum and others. It has already provided the zinc smelter with materials which have produced over one-quarter of the world's output of zinc, and bids fair to account for the treatment of a considerably larger tonnage of poor copper ores. At one mine alone a plant has been installed to treat 3600 tons per day of low-grade chalcopyrite ore; while the total material the process has already handled annually runs into several million tons. About one-half to three-quarters of a horsepower per box is required for the ordinary froth-flotation plant. The agitation shaft rotates at the speed of about 300 to 350 revolutions. The peripheral speed of the impellers is about 1500 ft. per minute.

A further feature of the froth-flotation plant is its compactness. A modern 300-ton unit, exclusive of the crushing plant, was housed in a building 37x15x12 ft. The cost of a flotation plant is usually given at about 25% under that of a wet concentration plant, but comparing the actual separation items involved in both it would come to far less. Thus the cost of eight-box flotation units for treating 300 tons of ore per day would be about £1000, a low cost in comparison with that demanded by a wet concentration plant of like capacity. A 60-ton plant would cost about £500. The best results in froth flotation are obtained by a two-stage treatment. In the first stage the aim should be the highest attainable recovery. In the second stage, take the concentrate from the first stage and put it through a reconcentration attaining the highest possible percentage of copper. The tailings from the second plant will be high, but can then be sent back to the first box of the first unit, so that there is no loss in this second-stage process.

Stretcher for Tracing Cloth

Draftsmen experience inconvenience owing to the stretch of drawing paper and tracing cloth after it is tacked to the board, and the larger the drawing the greater the difficulty. This is especially so, says H. R. Bowman (*Am. Machinist*, Nov. 21, 1912), when using tracing cloth.



A Stretcher for Tracing Cloth and Drawing Paper

The device shown is simple, cheap, and gives a uniform stretch. It is composed of a light wooden frame with the diagonal strips *A* and four adjustable clamps *B*, to which the corners of the tracing cloth *C* are fastened with thumb tacks. The clamps may be placed any desired distance apart to suit different sizes of drawings, pulled fairly tight and held in position by inserting pins through the holes in the sheet-metal body and corresponding holes in the diagonal strips.

Friction Loss in Wrought-Iron Pipe

Due to widely varying tables that appear in different handbooks and the necessity of elaborate interpolation to make them usable, a great deal of time is generally wasted in solving problems in which friction of water in pipes is a factor. Ira N. Evans (*Power*, July 9, 1912), has taken six of the best formulas for the friction of water in commercial wrought-iron pipe, together with the results of several tests, and compared them in tabular form.

The following were the principal formulas used by Mr. Evans in obtaining his average:

(1) Williams & Hazen formula:

$$V = cr^{0.63}\left(\frac{h}{l}\right)^{0.54} 0.001^{-0.04}$$

V = Velocity in feet per second;
c = Constant varying with condition of the pipe;
r = Hydraulic radius = $\frac{d}{4}$ in feet;
h = Friction head;
l = Length of pipe in feet.

The constant 120 gave results for most of the sizes higher than the average, while the factor 125 would give results checking closely with the average.

(2) Darcy's formula:

$$h = 0.003732\, l V^2 \frac{D+1}{D^2}$$

D = Diameter in inches.

This formula gives values higher than the average.

(3) Meier's formula:

$$h = 0.0038\, l \frac{V^{1.86}}{D^{1.25}}$$

D = Diameter in feet.

(4) Harrisons formula:

$$h = 0.00375\, l \frac{V^2}{D}$$

D = Diameter in inches.

The results from this formula are below the average for pipe up to 6 in. in diameter.

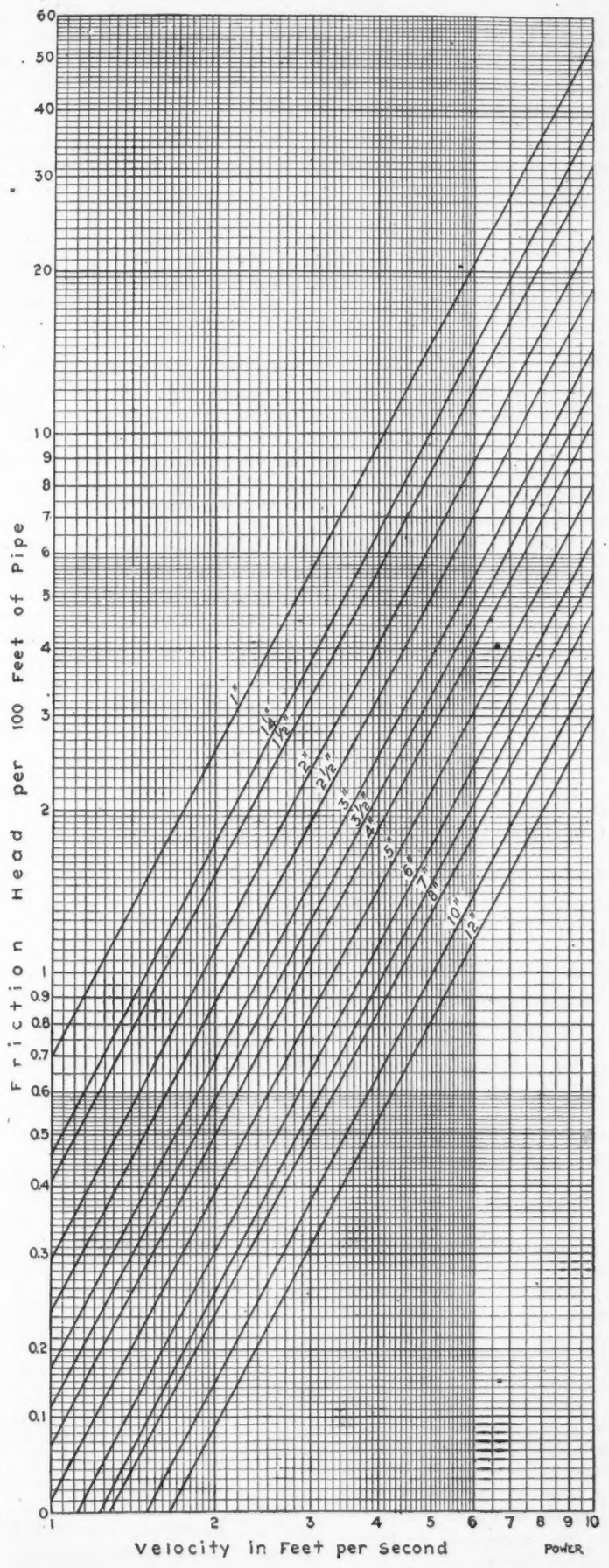
(5) Fanning's formula:

$$h = f \frac{l V^2}{d\, 2\, g}$$

The constant f varies for each change in size and velocity. This formula follows the average closely and gives results more consistent than the others except that of Williams & Hazen.

(6) Serginsky's formula, compiled from the latest German authorities, was also used. It gives results above the average for small sizes and below the average for large sizes.

The average values derived by Mr. Evans, mainly by the foregoing formulas, have been plotted by W. L. Durand, on logarithmic paper, as shown in the accompanying curves (*Power*, Oct. 29, 1912). All equations of the general form $y = B x^n$ will plot at straight lines. Several of the formulas are of this form,



FRICTION HEAD IN PIPES 1 TO 12 IN. IN DIAMETER

and those that are not vary from a straight line to only a slight extent. The average values then may safely be represented by a straight line, as the greatest variation will be much less than the difference between any two values that make up the average.

The method of using these curves is self-evident, there being three variables and in any problem containing two of them the third can be found immediately from the chart. If only one variable is known, several values of one of the other two may be assumed and the corresponding values of the third found from the chart. The values that seem to best fit the problem may then be chosen.

The chart is plotted with velocities from 1 to 10 ft. per sec. as abscissas and friction head per 100 ft. from 0.1 ft. to 100 ft. as ordinates. Each curve is for a definite pipe size as indicated, and with a little variation, all the way through for velocities of 1 ft. per sec., the chart shows values practically identical with the averages in Mr. Evans' table.

For example, take a 3-in. pipe with a velocity of flow of 6 ft. per sec., the friction head per 100 ft. of pipe would be 5.45 ft. To produce a drop in head of 2 ft. in 100 ft. of 5-in. pipe would require a velocity of 4.7 ft. per second.

Strength of Commercial Size Timbers

Tables for the designing of wooden beams, based upon an allowable stress of 1000 lb. per sq.in. and showing safe loads and deflections on beams of varying depths and lengths, are familiar to all engineers. Such tables are accurate only for nominal cross-sectional dimensions and not for the real dimensions common in commercial lumber, says R. C. Hardman (*Eng. News*, Oct. 31, 1912). For instance practically 95% of the southern yellow pine on the market is classified and graded under the rules of the Southern Yellow Pine Manufacturers' Association and in actual size is from ¼ to ⅝ in. smaller in dimension than called for by its nominal size. These variations as standarized by the Association, are as shown in Table I, lumber designated "S1S1E" being surfaced on one side and one edge and that designated "S4S" being surfaced on four sides. Full-size stock cannot usually be secured without a special order.

It is obvious that strength formulas applicable to nominal sizes will not give correct results for these smaller commercial sizes. For instance, standard tables show that a 2x4-in. yellow pine beam will carry for a 10-ft. span, with an allowable stress of 1500 lb. per sq.in., a safe load of 534 lb. Commercial 2x4's, S1S1E, are actually 1⅝x3⅝

in., and, S4S, are 1½x3½, which sizes figure safe loads of only 356 and 306 lb., respectively, decreases of 33% and 43% from the safe loads as usually tabulated. These percentages of decrease, which are large in the smaller sizes, shrink to 6% and 12%, respectively, for a 12x12, for instance. In computing deflections the discrepancy is found to be still greater, as the deflection varies inversely as bd^3, while in stresses the variation is as bd^2. Thus for the beam given above, the increased deflections are approximately 40% and 50%, respectively.

In the case of struts, in which the end bearing only is considered, we find that a 4x4, for example, becomes a 3⅝ x3⅝, or a 3½x3½, as the case may be, and will carry but 82% and 77%, respectively, of the load based upon the nominal size of a 4x4. If, however, the strut is long enough to be acted upon by combined compression and flexure, the variation becomes greater. For a 4x4-in. column, 10 ft. long, computed by Rankine's formula, it is found that the commercial sizes will carry but 70% and 62%, respectively.

To summarize:

Beam, 2x4-in. 10 ft. long:	
Safe load, S1S1E	33% decrease
Safe load, S4S	43% decrease
Deflection, S1S1E	40% increase
Deflection, S4S	50% increase
Strut, 4x4-in:	
Safe load, S1S1E	18% decrease
Safe load, S4S	23% decrease
Column, 4x4-in. 10 ft. long:	
Safe load, S1S1E	30% decrease
Safe load, S4S	38% decrease

To care for this error, the accompanying Table II has been prepared for use in designing. It is exact to the extent of a slide-rule check. Table gives the actual sizes of the various nominal sizes of yellow pine lumber as given by the Southern Yellow Pine Manufacturers' Association. Table II gives factors by which the usual tabulated values of safe load should be multiplied to give the true and safe loads for commercial sizes. As an example: In the case of the beam first given—2x4 in. x 10 ft.—the handbook tables show 534 lb. Multiply this value by 0.667 (Table II for S1S1E) which gives 356 lb., the actual value for a 1⅝x3⅝-in. x 10-ft. beam.

Similar tables for other varieties of woods and other commercial sizes can readily be made. In view of the increased and general use of the smaller sizes in concrete forms, etc., and the growing tendency among engineers to design their forms instead of permitting contractors' foremen to "slap them up" in a haphazard manner, it seems that these corrections for commercial sizes of lumber are pertinent, and demanded by the dictates of careful designing.

TABLE II. SHOWING FACTORS BY WHICH TABULATED VALUES OF SAFE LOADS ON BEAMS SHOULD BE MULTIPLIED

Breadth / Depth	2	4	6	8	10	12
For S1S1E:						
4 in.	0.667	0.744				
6 in.	0.714	0.796	0.824			
8 in.	0.714	0.823	0.899	0.909		
10 in.	0.735	0.839	0.911	0.921	0.927	
12 in.	0.746	0.850	0.918	0.929	0.942	0.939
For S4S:						
4 in.	0.574	0.670				
6 in.	0.630	0.735	0.770			
8 in.	0.638	0.769	0.806	0.824		
10 in.	0.659	0.790	0.827	0.846	0.857	
12 in.	0.674	0.804	0.842	0.861	0.872	0.880

TABLE I. ACTUAL SIZES OF LUMBER IN INCHES.

(Southern Yellow Pine Manufacturers' Association.)

Breadth / Depth	2-in.	4-in.	6-in.	8-in.	10-in.	12-in.
For S1S1E:						
4-in	1½x3½	3½x3½				
6-in	1½x5½	3½x5½	5½x5½			
8-in	1½x7½	3½x7½	5½x7½	7½x7½		
10-in	1½x9½	3½x9½	5½x9½	7½x9½	9½x9½	
12-in	1½x11½	3½x11½	5½x11½	7½x11½	9½x11½	11½x11½
For S4S:						
4	1½x3½	3½x3½				
6	1½x5½	3½x5½	5½x5½			
8	1½x7½	3½x7½	5½x7½	7½x7½		
10	1½x9½	3½x9½	5½x9½	7½x9½	9½x9½	
12	1½x11½	3½x11½	5½x11½	7½x11½	9½x11½	11½x11½

The Murex Process

As is well known, the Murex process consists in agitating ore with magnetite and an oil. The mixture of oil and magnetite coats the mineral particles but not the particles of gangue. The oiled mixture is then passed through a magnetic separating apparatus and the mineral and magnetite removed. In U. S. patents 1,043,850 and 1,043,851, assigned to the Murex Magnetic Co., Ltd., of London, A. A. Lockwood describes improvements in this process. He has discovered that if a silicate of an alkali metal be added to the mixture of magnetite and oil, the coating of the metallic or mineral particles is selective, so that minerals may be separated from each other, as well as from gangue. Again, those ores in which the metallic constituents consist wholly or partially of oxides or carbonates are easily and cheaply oiled or prepared with magnetite to the exclusion of the gangue by adding such a silicate.

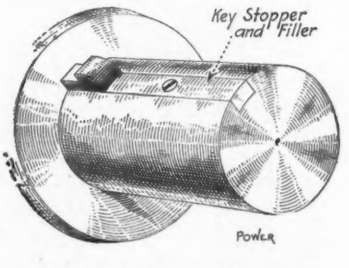
For instance, if a sulphide ore with silicate gangue, assaying 13.7% lead, 16.35% zinc, and 13 oz. of silver per ton, be agitated for 20 min., with silicate of soda equivalent in amount of 20 oz. of a 5% solution; 800 lb. of water; and 20 lb. of a magnetic paint composed of two parts by weight of magnetite to one of residium oil; and this charge then treated in a wet magnetic separator, the result is that the greater portion of the lead and silver is attracted and thus separated from the greater portion of the zinc and the remaining silver.

It has been usual to form the magnetic paint by mixing dry magnetite with oil. In using this silicate process it is not necessary to mix the magnetite with the oil previously, but the magnetite while wet with water may be agitated together with the ore and the oil. It therefore is no longer necessary to go to the expense of drying the magnetite as recovered in the new practice, before using again. Or, it is possible to make up the oil-magnetite paste with wet magnetite, and then agitate with the ore.

The coating of the metallic particles of ores wherein the mineral consists wholly or partially of oxides or carbonates, is also easily and cheaply effected to the exclusion of the gangue, by means of an oily liquid in the presence of water by adding at some stage of the process a small quantity of a carbonate of an alkali metal, either alone or in combination with the silicate of an alkali. Having obtained such a coating by means of the alkali carbonate solution, the Murex process is then said to be applicable to such minerals. It is also stated that wet magnetite can be oiled successfully in the presence of alkaline carbonates.

Safety Stop for Keys

The keys which lock flywheels or pulleys on their shafts may work out at times and cause much annoyance and delay. The accompanying drawing shows a simple and effective device to overcome this difficulty, as described by C. J. Mason (*Power*, Oct. 22, 1912).



SAFETY STOP FOR KEYWAYS

The unused part of the keyseat is filled with a neatly fitted false key. This acts as a stopper and also preserves the symmetry of the shaft end.

The Cost of Doing Things

Data from Mining and Metallurgical Practice

Hand Sorting Ore

Probably as good an example of the results of hand sorting as could be used is the one given by J. R. Finlay in his "Cost of Mining," in reference to Cripple Creek ores. "Let us take as a practical example a body of 10,000 tons of ore running 1 oz. of gold per ton. This ore can be shipped without sorting at a handsome profit as follows:

Gross value of ore	$200,000
Cost of mining 10,000 tons at $3	30,000
Freight and treatment at $8.25	82,500
Total cost	$112,500
Profit	87,500

"But suppose we reject half of this ore by sorting, by so doing we throw away 5000 tons that will average $2.50 per ton or $12,500. The cost of sorting at 50c. per ton (of ore accepted) will be $2500 more. Then our shipment will be as follows:"

5000 tons at $37.50 per ton	$187,500
Cost of mining and sorting $6.50	32,500
Freight and treatment at $11.25	56,250
Total cost	$88,750
Profit	98,750

Here the cost of mining would be twice as great with an additional charge of 50c. per ton for sorting and $3 for freight and treatment with the gross value of the ore lowered $12,500, yet the net profit from sorting is $11,250. This example was taken from actual practice in the Cripple Creek district.

In the Lake Superior copper district the mines follow the practice of crushing and sorting the ore at the mines before shipping to the mills and in some cases a great amount of sorting is done underground as at the Copper Range mines. In 1910, at the Osceola Consolidated, 3.5% of the rock hoisted was discarded by sorting and in 1911 about 2.365%. The Mohawk Mining Co. discarded 11.11% in 1911. The Allouez averaged about 2% in the last two years. At the Copper Range mines; the Baltic, Champion and Trimountain, 8.36%, 6.7% and 11.4% respectively were discarded from ore hoisted in 1911. At the Tamarack, 22.1% was discarded in 1910 against 18% in 1911 and at the Ahmeek 6.8% during 1910 and 3% in 1911. The Wolverine, one of the lowest cost mines in the district, discarded 3.2% of its ore in 1911 at a cost of 4.8c. per ton milled for crushing and sorting, this cost is much lower than at the Mohawk, where the expense was 6.65c. per ton milled, but in this case the percentage of rock thrown away was over three times as great in proportion. Isle Royale discarded 14.6% in 1910; 19% in 1911; Centennial, 3.734% in 1910; 0.00214% in 1911.

At the Buffalo Mines, Ltd., Cobalt, Canada, about 11.5% of the ore was sorted out as waste. In Nevada at the Round Mountain Mining Co., 54% of the tonnage is rejected as waste and it is hoped by installing an underground crushing plant enough can be sorted out to bring the percentage up to at least 66% of the total tonnage.

In South Australia at the Wallaroo & Moonta mines the average ore hoisted has averaged from 3 to 4% copper and by sorting it has been raised to approximately 11% average. In India at the Ooregum Gold Mining Co. and the Nundydroog Mines, Ooregum, South India, the discard in 1911 amounted to 10.7 and 11.3% respectively of the rock hoisted. A record of a zinc mine in southwest Missouri shows that of 305,000 tons mined about 5% was sorted out, ranging from 9% to 2.5% per year.

Of the South African gold mines in 1911, ore was discarded by sorting about as follows:

At the Robinson Gold Mining Co. 16.6%, Meyer & Charlton 5.11%, Cinderella Consolidated 13.6%, West Rand Consolidated 11.01% and at the New Goch mine 28.52% of the tonnage was hoisted. At the Ferreira Deep the discarded ore from sorting has averaged about 16.3% of the tonnage hoisted during the last six years and has ranged from 10.64% to 19.70%. In 1911 when 19.70% was sorted out, the waste had an average gold contents of about 0.7 dwt. per ton, and it is probable that the net saving by sorting amounted to $80,000 or $90,000 for the year. Most of the companies include the cost of sorting in the cost of crushing in their reports and for this reason the actual cost of sorting cannot be given. These figures will serve to show the widespread practice of discarding all waste possible before it reaches the mill or treatment plant. The cost of sorting will vary with the character of the ore and depends largely upon the ease with which the waste can be identified from the ore. In the case of the ores of Goldfield, Nev., though sorting would probably be profitable, even at a high cost per ton, it is impossible to distinguish ore from waste and hence impracticable to do hand sorting.

Mammoth Copper Mining Co.

The following article was written from data furnished by G. W. Metcalfe, general manager of the Mammoth Copper Mining Co., Mammoth, Shasta County, Calif., and represents the average standard of work during 1911. The mines are in a rugged country on the western side of the Sacramento River. The orebodies consist of long flat-lying lenses in a porphyry formation. All work is carried on through tunnels. The horizontal slicing and caving system is employed in mining.

According to the figures furnished, 270,291 tons of ore were mined during the year; 248,786 tons, or 92%, coming from the stopes, and 21,505 tons, or 8%, from development work. In addition to this tonnage, 31,328 tons of waste were removed in development, making a total of 301,619 tons of rock mined. The development work amounted to 8243 linear feet, of which 7028 ft. were drifts and crosscuts, 1199 ft. raises and 16 ft. winzes. The average number of employees was 302, divided as follows: Stoping, 150; development, 47; miscellaneous underground, 40; and surface at mine, 65 men. Of the 150 men engaged in stoping, 53 were breaking ore, 52 shoveling, five tramming ore to chutes and 40 timbering. Practically all the man-tramming is confined to sublevels, as electric locomotives are used in main levels. In development 20 men were engaged in advancing, 19 in mucking and tramming and eight in timbering.

These figures indicate that 895 tons of ore, or 998 tons of ore and waste, are secured per year per man employed underground and on surface at the mines, while per man employed underground the average is 1140 tons of ore, or 1270 tons of ore and waste. In stopes 1655 tons of ore are mined per year per man engaged in breaking, moving ore to chutes and timbering, while the men breaking ore average about 4700 tons per year per man. The stope labor for moving ore to chutes is equal to about one man for every 4360 tons per year, and for timbering about one for every 6200 tons.

In development the ratio of ore secured to waste removed is about 1: 1.45, and footage about one foot of development to 2.6 tons of ore secured. The labor, including men advancing, mucking and timbering, is equal to approximately one

man for every 175 linear feet of advance per year. Men engaged in advancing average about 412 ft. per year. The labor for mucking is equal to about one man for every 434 ft. of advance per year, and for timbering one man for every 1030 ft. The miscellaneous underground employees are equal to one man for every 7540 tons of ore and waste handled per year, while the surface employees are equivalent to one for every 4640 tons.

Dynamite consumption amounted to 260,255 lb.; 112,045 lb. or one pound for every 2.22 tons of ore in stopes, and 148,180 lb., or 18 lb. for every linear foot of advance in development. Timber consumption, exclusive of round stulls and posts, which amounted to 20,000 linear feet, was approximately 8.7 bd.ft. per ton of ore produced; timber in stopes was equal to 8.06 bd.ft. per ton of ore from stopes; in development 27.5 bd.ft. per linear foot of advance, and in general repairs and surface 0.53 bd.ft. per ton of ore produced.

Main drifts and stations are lighted by electricity; the average candle consumption was 3.547 candles per man per eight-hour shift. Total machine shifts in stoping amounted to 6557, and in development 5140; this indicates that the average machine shift will break about 38 tons of ore in stopes and make 1.6 linear feet of advance in development. Drill-steel consumption was about one pound for every 6.6 tons of ore produced, including 1500 lb. of hand-drill steel. The average consumption of compressed air for operating 34 piston and five hammer drills was 902,300 cu.ft. per day. In nine hours two men sharpen an average of 476 drills with a drill sharpener, a motor-driven blower being used for air blast to forge and 26 gal. of fuel oil being consumed in the forge. This is equivalent to 26.4 drills per man-hour and one gallon of fuel oil for every 18.3 drills sharpened.

It requires about one hour to set up drills in drift and in eight hours an average of 60 ft. of holes is drilled, usually making two setups. In stopes, using Ingersoll-Sergeant D-24 drills, an average of 45 ft. of holes is drilled in eight hours. One-quarter of a pint of lubricating oil is consumed per piston drill per shift. In tramming fifty 4-ton cars are used for main haulage, drawn by electric locomotives; the oil consumption on these cars is about 1.11 gal. per month.

In driving a 7x9-ft. drift through porphyry and mineralized porphyry, four men, working 56 shifts of eight hours each, advanced 138 ft., using an Ingersoll-Sergeant D-24 drill, drilling approximately six hours per shift and consuming 2850 lb. of dynamite. This is equal to about 4.8 cu.ft. of drift per man-hour, and the dynamite consumption is equivalent to 0.328 lb. per cu.ft. of drift. It required about 20 man-hours to timber. In running a 6x12-ft. raise through the same kind of ground with 2⅓ men per shift, it required 30 eight-hour shifts to advance 58 ft. with two Waugh drills drilling about six hours per shift, and 975 lb. of dynamite were consumed. According to this, 7.46 cu.ft. were advanced per man-hour, and the dynamite consumption was equal to 0.234 lb. per cu.ft. of raise. It required 180 man-hours to do the timbering.

Unit Costs at British Columbia Copper Co.

The Mother Lode group, belonging to the British Columbia Copper Co., Ltd., is situated at Greenwood, B. C., in what is known as the Deadwood camp. The ore occurs in contact deposits between limestone and eruptive dikes. According to data furnished by R. H. Eggleston, secretary, the rock mined at the Mother Lode mine is an altered limestone or limestone replaced by actinolite, garnet, epidote, magnetite and metallic sulphides. During the period from Apr. 1 to Sept. 30, 1912, or 166 working days, 184,644 tons of ore were mined, or an average of 1112 tons per day, all of which was produced from stopes. The average hoisting depth was approximately 375 ft. All stoping is done by the chamber and hollow-pillar system. The labor is of mixed nationalities, but may be said to consist of good Western American laborers. Altogether 109 men worked per day during the period mentioned; of these 57 were employed in the stopes and 17 in miscellaneous underground work, a total of 74 underground, the remaining 35 were employed on surface at the mine. A list giving the various occupations of the men employed was furnished and is given herewith:

Underground	Surface
1 foreman	1 superintendent
23 machine men, piston	1 master-mechanic
13 machine men, hammer	2 skip hoistmen
3 timbermen	2 cage hoistmen
2 blasters	3 compressor engineers
1 powderman	4 blacksmiths
6 motormen	2 machinists
12 chutemen	1 carpenter
1 barman	4 crusher and conveyor
1 nipper	1 railway car loader
1 pipe and track	1 electrician
4 ship loaders	1 watchman
2 cage tenders	1 barn boss
4 shift bosses	1 general surface
	2 office and warehouse
	8 boarding house
74 total	35 total

According to these figures, about 11 tons are secured per working day per man employed, not including employees in boarding house. The rate of production per underground employee is about 15 tons per day. The average daily production per man engaged in breaking ore is about 30.9 tons, and per man stoping 19.5 tons, while apparently 61.5 tons are taken out per day per man engaged in tramming ore. It will be noticed that no labor is needed to move ore to chutes and that only one timberman is employed for every 371 tons of ore mined per day. The ratio of other employees to daily production may be obtained by referring to the list showing the various occupations, the daily production being 1112 tons, as mentioned. During this period 40,250 bd.ft. of timber were used in stopes, or about 0.217 bd.ft. per ton of ore extracted, general repairs and surface work consumed about 0.065 bd.ft. per ton of ore. Dynamite consumption was equal to 0.67 lb. per ton.

All main drifts and stations are lighted by electricity and the candle consumption is at the rate of four or five per man per eight-hour shift. A total of 1560 machine-drill outfits, with 3¼-in. drills, were worked during this period, which indicates about 118 tons per drill-shift. Using a Sullivan 3¼-in., U. F. 2 drill, an average of 31 ft. of holes are drilled per drill-shift. The consumption of lubricating oil on drills is about 0.75 pint per shift.

Tramming is done both by horses and by electric locomotives, it is estimated that one man loading from a chute into a 2.15-ton car and moving the ore 450 ft. will handle from 31 to 32 cars in an eight-hour shift, which is equivalent to about 8.4 tons per man-hour.

Steam Shovel Work

The highest record made so far on the Panama Canal by a 70-ton shovel was made on Sept. 20, when 3910 cu.yd. were removed in eight hours. An article in the *Excavating Engineer*, November, 1912, discussing the Western Maryland R.R. extension to Connellsville gives the cost of moving 37,100 cu.yd. of earth by a 70-ton Bucyrus shovel in 30 days as follows:

Total expense of shovel, including superintendent, walking boss, shovel and dinkey crews and all other labor	$0.0975
Cost of explosives	0.0075
Cost of trestle	0.0050
Cost of coal	0.0075
Cost of oil and waste	0.0015
Cost of water	0.00333
Cost of interest on plant	0.00333
Cost of depreciation	0.0125
Total cost per cu.yd. removed	$0.13816

The work was performed in single 10-hr. shifts. The tracks were maintained by a crew of four men and foreman, and it was possible for the 16-ton dinkey engine to haul twelve 4-cu.yd. cars at a high rate of speed. The entire load was dumped from a trestle on to fill and it required eight men and foreman to keep trestle and dump in shape. During the first half of the period the shovel was working in hard sandstone about 12 ft. thick, which broke into large boulders, this material made up 16,000 cu.yd. of the entire amount handled. The remaining material consisted of a black shale. On an average of one hour was lost per day shifting track on dump. Five 500-ft. moves were made during the period this material was moved.

Nipissing High Grade Mill, Cobalt

By R. B. Watson*

Although the high-grade silver ore is highly complex a remarkable recovery is obtained by a simple but unique process of tube-mill amalgamation. With 2500-oz. ore a typical tube-mill charge is 6500 lb. of 20-mesh ore, 8500 lb. of mercury, 3800 lb. of 5% cyanide solution and six tons of pebbles. About 97% of the total silver is recovered by amalgamation, a further extraction being made by subsequent cyanide treatment.

*General manager, Nipissing Mining Co., Ltd., Cobalt, Ont.

The high-grade ores of the Cobalt district consist mainly of the arsenides of cobalt and nickel in a calcite gangue with a large quantity of silver in the metallic state. A typical ore carries 10% silver, 9% cobalt, 6% nickel and 39% arsenic; the rest is lime, silica and smaller amounts of antimony, iron, sulphur, tellurium, etc.

Ore is Complex

The complex nature of the ore and its high content in arsenic make it an undesirable ore for the ordinary custom smelter, who is compelled to charge a high price for its reduction. The general practice is to smelt in a blast furnace where a large part of the silver is recovered at once as base bullion; the resulting speiss is roasted and treated in the wet way for the recovery of the cobalt, nickel and the rest of the silver. This process is slow; the necessary plant costs several hundred thousand dollars, and a large working capital must be available to carry on the business.

Another serious problem in shipping to a smelter was the difficulty in obtaining a fair sample of the ore. This is always a tender point when a mine is marketing ore, but when the ore carries several thousand ounces of silver per ton and the silver occurs in the metallic state, ranging in size from the smallest particles up to nuggets the size of one's hand, the difficulty of sampling is enormously increased.

Great improvement, however, has been made in this part of the marketing, by the building of the Campbell & Deyell custom sampling works at Cobalt, where the ore is crushed in a ball mill fitted with 10- to 20-mesh screens. All metallics coarser than this mesh remain in the mill and are subsequently removed and melted down to bullion. The pulp can then be sampled with a reasonable degree of accuracy.

The marketing expense is made up of smelter deduction, treatment, freight, assaying, representation at smeltery, etc. On 23 carloads of ore averaging 2560 oz. per ton, the marketing expense was 5.57% of the gross value, (with silver at 60 c. per oz.) or $83.55 per ton. In addition to the above direct charge, there is a loss of interest from the date of shipment to the date of payment, which averages 65 days on shipments to Canadian smelters, and all ore is settled for on the commercial assay, which is about 1% lower than the actual assay on this grade of ore.

As the largest producer in the district, the Nipissing Mining Co., Ltd., had been trying for several years to find a simple process by which its high-grade ores could be treated at the mine without going to the large expense of building the usual smeltery. To this end a great many processes had been investigated and one small experimental plant was built; the trouble with most of the processes is the complication of the operations and the consequent tying up of a large amount of money.

A Unique Process Used

It remained to Charles Butters and his assistant, G. H. Clevenger, finally to work out a process which promised to be so simple and effective that the Nipissing company decided to build the necessary plant at once. James Johnston designed and constructed the plant which went into operation February, 1911, and has run successfully ever since.

The high-grade ore from the picking tables is delivered to the sampling plant at the top of the mill where it is put through a 9x15-in. Blake crusher and elevated to a steel receiving bin. From this it is fed automatically into a No. 3 6-ft. Krupp ball mill carrying 1000 lb. of steel balls and fitted with 20-mesh screens. The metallics or silver nuggets which will not pass the screen are removed periodically by taking off a screen, and are melted down in the refinery. From the ball mill the pulp is delivered by a spiral feed to a Vezin sampler and elevated to two 60-ton steel storage tanks, from which it is drawn as needed for treatment in the mill.

Amalgamation in Tube Mill the Chief Operation

The main operation consists of amalgamating the silver in a 5% cyanide solution while the 20-mesh material is being ground in a tube mill. The mill used is a Krupp mill 3 ft. 11 in. in diameter and 19 ft. 8 in. long, fitted with silex liners and run at 37 r.p.m. The weight of ore per charge depends somewhat on the silver content, but with 2500-oz. ore the ordinary tube-mill charge is 6500 lb. of ore; 8500 lb. of mercury; 3800 lb. of cyanide solution, and six tons of pebbles.

The materials are charged through a manhole on the top of the mill, and after the cover has been replaced the mill is revolved for 9½ hr., when 99% of the pulp will pass a 200-mesh screen. This fine grinding is necessary to liberate the fine particles of silver and permit of complete amalgamation. A screen analysis of the final tailing shows that the coarser particles are much richer than the slime; this is also shown by the

Two Views of Nipissing High-grade Mill, Cobalt, Ont.

accompanying screen tests on ore crushed through a 10-mesh screen.

It was found advantageous to have a certain quantity of silver go into solution in the cyanide, and to this end more air had to be supplied to the charge.

Each gudgeon of the mill is fitted with a stuffing box through which passes a heavy cast-iron pipe, four inches outside diameter, with a 1½-in. hole through the center. The casting is held stationary by bolts to the concrete foundation, and

GRADING ANALYSIS OF NIPISSING ORE CRUSHED THROUGH 10-MESH

Mesh	Percentage by weight	Silver oz. per ton
+ 20	12.7	6837
+ 40	26.2	3375
+ 60	11.6	2330
+ 80	6.3	1954
+ 100	6.3	1654
+ 120	2.7	1348
+ 150	1.3	1182
+ 200	3.8	1202
— 200	29.1	706

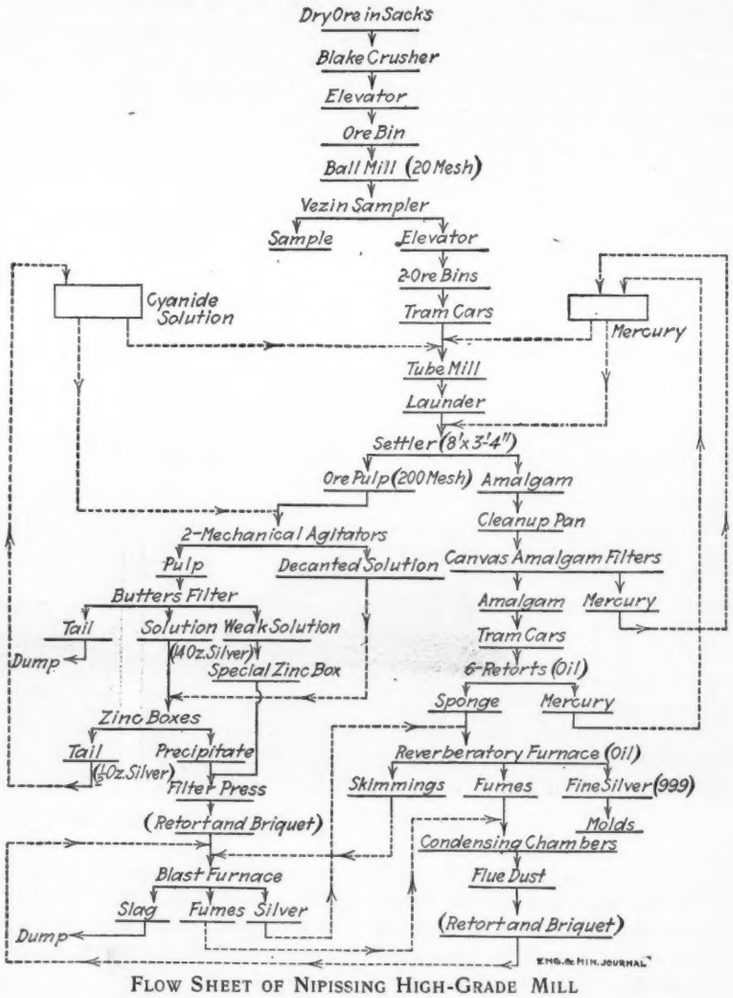
the mill revolves about the pipe. Compressed air under 25 lb. pressure is introduced through one of the hollow castings. At the outlet end there is a right-angle turn in the hollow casting just inside the mill and the upper end reaches to within ½ in. of the lining. The heavy cast-iron elbow, therefore, remains stationary, the inside leg stands vertical, and the upper end remains above the level of the charge at all times, allowing the compressed air to escape while the mill is in motion. The casting is heavy enough to withstand the battering of the pebbles falling against it. This arrangement allows the mill to be filled well above the center with a consequent decrease in the power used, but it is found that the best results are obtained by filling the mill to a point two inches above the center.

Tube-mill Product Washed and Settled

At the end of the grinding period the three manhole covers are replaced by coarse screens and the mill is turned over; the charge falls into a sheet-iron hopper which delivers it into an all-iron settler, eight feet in diameter, fitted with wooden shoes. The tube mill is then washed out twice by revolving it with a ton of solution and 1500 lb. of mercury. These washes are added to the charge and the settler filled with solution; the charge is kept in agitation by the muller while the amalgam is drawn off into an iron cleanup pan, and from there into canvas amalgam filters, of which there are 24, each holding 400 lb. of amalgam. The pulp is gradually run out of the settler by drawing the top plug, the balance of the charge being washed twice with solution. When the flow of amalgam has ceased, the mercury, as it drains out of the canvas filters, is pumped back to the settler to wash out any remaining amalgam. The bottom plug is finally drawn and the balance of the pulp discharged. It requires two hours to dump the charge and get the amalgam into the filters.

Remarkable Recovery by Amalgamation

It was soon found that the amalgam must be kept exceedingly thin, otherwise it would stick in the tube mill and cake under the muller of the settler; hence the mercury used is 15 times the weight of the silver in the ore. After draining in the sacks, the amalgam still carries 78% mercury. The remarkable part



Flow Sheet of Nipissing High-Grade Mill

about the whole process is that 97% to 98% of the total silver in the ore yields to amalgamation in the tube mill. An ore assaying 2500 oz. per ton is reduced to 50 to 75 oz. per ton when it leaves the settler.

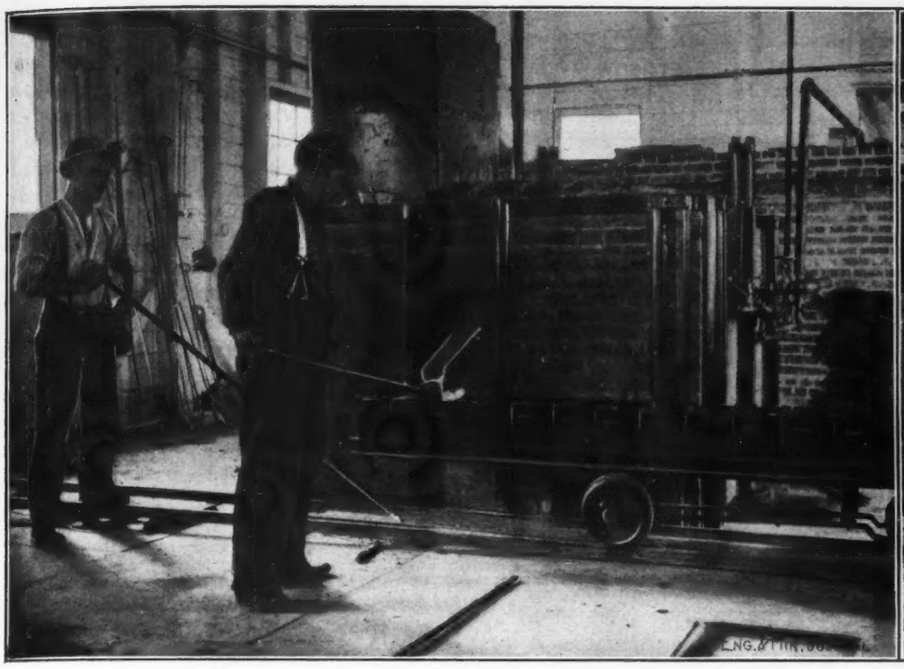
Cyanidation Plays a Minor Role

The cyanide treatment of the pulp which follows is comparatively unimportant as it deals only with six or seven tons of 50-oz. ore daily. There are four 16x7-ft. wooden tanks for the collection and treatment of the pulp, and the necessary tanks for storage of solution and water. A charge for agitation is made up of four tube-mill charges or 13 tons of dry pulp. Five pounds of lime per dry ton of pulp are added and the charge is agitated for 36 hr.; the tanks are fitted with mechanical agitators, and the pulp is circulated through a pump as well. The cyanide strength is 0.75 per cent.

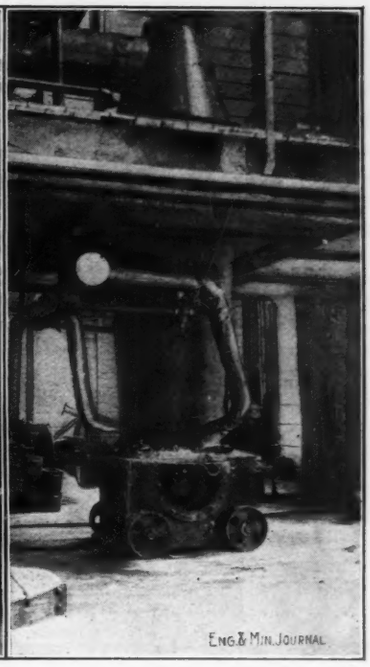
After settling, the solution is decanted, and the pulp, having a specific gravity of 2, is run to a Butters filter of 19 leaves. The specific gravity of the ore is 6, and to avoid the settling of the pulp in the bottom of the filter box while the cake is forming, the charge is kept in circulation by an air lift drawing out of the bottom of the box and delivering at the top. The cake is washed 2½ hr. with weak solution and then discharged. The arsenides of cobalt and nickel go through the process practically unchanged; the residue for the first seven months of this year contained 9% cobalt and 4.5% nickel.

Evidence of Mercury in Ore

The complex nature of this residue is shown by the following analysis by Johnson & Sons on some of last year's product: Nickel, 9.72%; cobalt, 5.85%;

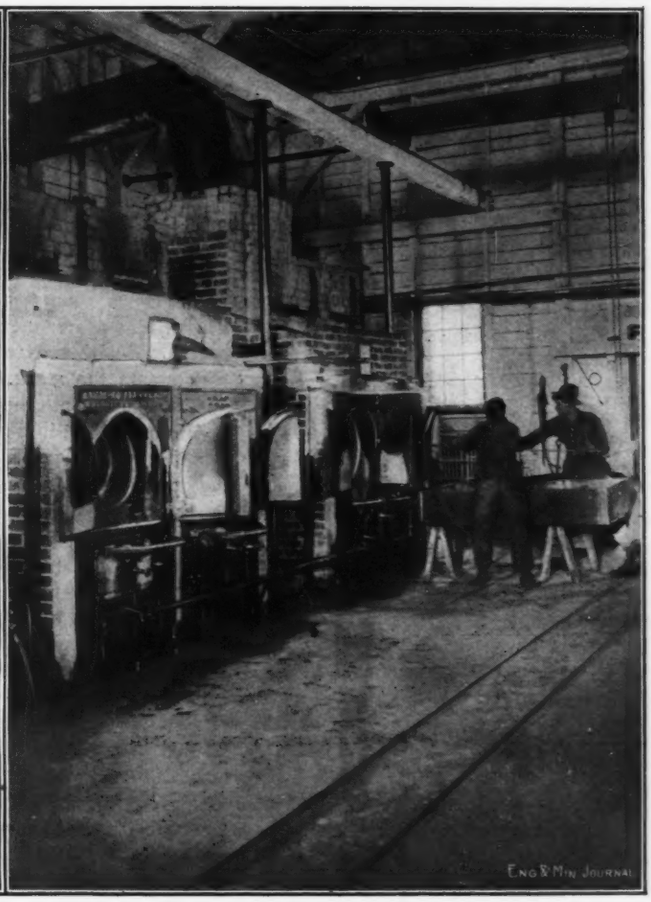


OIL-FIRED REVERBERATORY FURNACE USED AT NIPISSING HIGH-GRADE MILL IN REFINING AMALGAM SPONGE AND BULLION



CYANIDE PRECIPITATE, FLUE DUST AND SKIMMINGS ARE SMELTED IN A BLAST FURNACE

SETTLER, CLEANUP PAN AND CANVAS AMALGAM FILTERS FOR TREATING THE TUBE-MILL PRODUCTS



REMOVING AMALGAM SPONGE FROM RETORTS FOR SUBSEQUENT TREATMENT IN REVERBERATORY FURNACE

iron, 2.58%; antimony, 3.80%; bismuth, 0.09%; copper, 0.06%; tellurium, 1.39%; arsenic, 29.50%; sulphur, 1.59%; silica, 11.44%; lime, 8.63%; magnesia, 2.91%; carbonic acid, 13.55%; combined water, 5.74%; mercury, alkali, oxygen, gold and silver, traces of zinc, tin and manganese, 3.15%. Determinations of mercury consumption indicated the presence of mercury in the ore itself. Investigation along this line showed that the ordinary high-grade ore of the district usually carries from two to five pounds of mercury per ton of ore, depending upon the amount of metallics contained. Tests were then made on the metallics alone; 21 samples of metallics taken from various Nipissing veins and from three other mines, showed mercury in every case; the result varied from eight to 95 lb. mercury per ton of metallics and averaged 35 pounds.

The presence of mercury in the metallics was proved on a large scale when the refinery was built; the first charge melted down in the reverberatory when the furnace and flues were clean, was a ton of metallics. A small bottle full of mercury was taken from the condenser and globules of mercury could be plainly seen through the flue dust.

Zinc-Box Precipitation Used

There are two zinc precipitation boxes, one for strong and one for weak solution. The precipitate from both boxes goes to an 18-in. Johnson filter press with 12 frames; the press holds 500 lb. of precipitate which assays 15,000 oz. silver per ton. The product of the cyanide plant amounts to 8000 to 10,000 oz. silver per month.

The solution going to the zinc box carries 14 oz. silver per ton, 0.028% mercury and 0.6% zinc. By passing through the box the mercury in solution is reduced to 0.015%, so it is necessary to retort the precipitate to recover the mercury. As no solution is thrown away, it has become very foul; after passing through the zinc box it runs to a storage tank in the bottom of which a precipitate collects. An analysis of this precipitate follows: Silver, 0.394%; mercury 2.51%; antimony, 3.30%; sulphur, 16.13%; arsenic, 32.64%; silica, 5.362%; zinc, 2.257%; iron, 5.04%; nickel, 9.06%; cobalt, 7.03%; lime, 9.24%; carbon dioxide, 7,259%; manganese, trace.

The sacks of amalgam are hoisted into a car with a cast-iron body, weighed and taken to the refinery which adjoins, but is separate from the mill building. There are six 14x60-in. retorts mounted in batteries of two. They are fired by oil, and the waste gases are conducted through a condenser before discharging them; this is to catch any mercury which might get into the flue on account of a cracked retort.

The retorts are filled three-quarters full of amalgam, fired for nine hours, and allowed to cool for six hours. The resulting sponge and mercury are weighed and compared with the weight of amalgam put in the retort; a cracked retort will sometimes be detected by the loss in weight when it has not been noticed by the man in charge. The sponge is 79% silver; the impurities are mainly arsenic, cobalt, nickel, antimony and bismuth.

The average life of a retort is 34 charges. As soon as the slightest crack appears the retort must be discarded at once. Occasionally a retort will break on the first firing, and retorts have been received which would not hold mercury when cold. Various grades of iron have been tried but the makers have not succeeded in turning out a cast-iron retort which will stand up to the hard and continuous work required. A soft gray iron, low in phosphorus, gives the best results.

Recently a cast-steel retort was installed; it is still in good condition after having been fired 82 times. A specially made wrought-iron retort with sides ⅜ in. thick is now on order; this will be slipped into a cast-iron cylinder which will take the weight of the charge and bear the brunt of the firing.

Melting in Reverberatory Furnace

The sponge from the retorts is melted down in a reverberatory furnace in charges containing 28,000 oz. of refined silver. The hearth is stationary and is made of brick contained in an iron pan, 5 ft. x 5 ft. 6 in., supported on rails. Heat is supplied by two oil burners; the waste gases pass first through a series of dust chambers, then through two iron pipes 3x27 ft. and to a fan which exhausts into the stack. Sprays of water are introduced into the last dust chamber and into the first iron pipe, the object being to cool the gases and condense any mercury that is driven off in melting the sponge, or that comes from a leaky retort.

As soon as the charge in the reverberatory is melted, air under 15 lb. pressure is blown on the surface through two iron pipes introduced at the back of the furnace. The oxides of cobalt, nickel and the other impurities rapidly rise to the surface and are scraped off through the charging door. No flux of any kind is added. The air blown on the surface of the metal has been heated by carrying the pipe through the dust chambers; this materially shortens the operation which usually takes 18 to 20 hr. After the surface of the metal has become mirrorlike it must still be blown several hours to expel the last traces of impurities.

Dip samples are taken and when the bath is 999 fine the air is shut off and the metal is covered with charcoal to absorb the included oxygen and thus avoid sprouting of the bars. The furnace is tapped through the side; the charge fills 25 molds which are run along under the spout on a car.

The first hearth was made of common firebrick; it lasted five months during which time 1,860,000 oz. were refined. The present hearth made of magnesite brick is still in good repair after nine months use and has turned out to date 3,236,000 fine ounces.

Precipitate Smelted in Blast Furnace

For the purpose of working up the skimming from the melting furnace, the flue dust and the zinc precipitate from the cyanide plant, a 20-in. round water-jacketed blast furnace was installed. The jacket is hung from the feed floor to allow removal of the curb. The flue is connected with the dust chambers. Before being charged to the blast furnace the flue dust and precipitate are retorted, then mixed with sugar water, briquetted and dried.

The skimming assays about 15,000 oz. silver per ton, the flue dust 700 oz., and the precipitate 15,000 to 18,000 oz. The charge is calculated according to the material to be put through; some of the mixtures used are as follows: Charge 1: 250 lb. of skimming; 300 lb. of slag; 100 lb. of coke. Charge 2: 100 lb. of skimming; 100 lb. of flue dust; 300 lb. of slag; 40 lb. of iron ore; 100 lb. of coke. Charge 3: 10 lb. of flue dust; 20 lb. of precipitate; 30 lb. of slag; 25 lb. of iron ore; 15 lb. of limestone. These charges gave a slag carrying from five to 11 oz. of silver per ton.

The charge being so rich in silver no lead is necessary. As soon as the crucible is half full of bullion the metal is drawn off into molds. A small amount of speiss is also formed. The bullion runs 800 fine and is melted down in the reverberatory with the sponge. It is only necessary to run the blast furnace one day in every 10, to clean up all the by-products.

The only product marketed is fine silver. It is shipped direct to London and sold at the daily quotation without refining charge. Shipments this year have amounted to 370,000 oz. per month. The bullion carries 0.0043% gold, equal to about $1 per 1200-oz. bar. The total cost of the plant was $67,757, which includes sampler, mill and refinery.

A discovery of tin in the Province of Atacama, Chile, is reported by the *Bulletin* of the Pan American Union.

Miners' Phthisis on the Rand—II

By Frederick L. Hoffman*

No class of mine labor is exempt from miners' phthisis, but machine drillers are most subject to it. Of machine drillers who had worked nine to 10 years underground, 79% had miners' phthisis. The commission classes it as an industrial disease, and subject to compensation as such.

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Before considering the results of the investigation it is necessary to take into account certain facts secured regarding the makeup of the mining population on the Rand. The mean age of all miners examined was 33.12 years, while the most common age was 29.51 years. For the purpose of comparison it is stated that the mean age of Cornish miners was 36.16 years; of the South African miners 35% were of South African birth, 51% were born in the British Isles, 4% in other British possessions, and the remaining 10% were distributed among foreign countries. Unfortunately the number and per cent. of American miners on the Rand is not stated. Regarding the previous occupations of miners, it was ascertained that 44% of the miners had no previous occupation, or in other words they had been employed at mining from the start of their working life. The proportion returned as having previously been farmers was 15%, but it is pointed out that in all probability the experience as to actual farming was very limited. As to conjugal condition it was found that 57% of the miners were married with an average family of three persons, that is, a wife and two children. Of this number 84% had their families resident in South Africa. An examination of the original returns exhibited also clearly the shifting nature of the mining population along the Reef. It is said that the average number of mines in which an individual miner works is often large, so that in the course of time the men are probably open to all of the varying conditions, from best to worst. For the purpose of the investigation the following classification of employments was adopted:

(1) Machine drillers; (2) hammermen; (3) trammers; (4) timbermen; (5) surveyors; (6) samplers; (7) others.

It is important, of course, to keep in mind that changes from one underground occupation to another frequently take place, and it is suggested that this fact must not be lost sight of when considering the effect of an occupational grouping in connection with the incidence of miners' phthisis.

Thirty-two Per cent of Miners Affected

The analysis of the returns for 3136 underground miners examined by the commission established the fact that 990, or 32%, were found to have miners' phthisis, in one or another stage of the disease. When this percentage is applied to the estimated number of 11,400 miners on the Rand, the number of men affected with miners' phthisis would be, approximately, 3600. Assuming that there are about 150,000 men employed in the mining of copper, precious metals and lead and zinc in the United States, the number of men affected with miners' phthisis, on the basis of the South African investigation, in the United States would be approximately 48,000. It may be stated, in this connection, that according to a special investigation into the mortality of copper miners at Butte, Mont., the percentage of deaths from tuberculosis at ages 25 to 44 was 28.5 and at ages of 45 to 64 it was 35.0 per cent[1].

Machine Drillers Most Subject to Miners' Phthisis

The commission points out that among the factors influencing the incidence of miners' phthisis are, first, the number of years spent in work underground in hard-rock mines, equivalent, of course, to the period of exposure to siliceous dust; and, second, the nature of the work actually done.

The examination also brought out the fact that the order of greatest risk among the different occupations was: (1) Machine drillers; (2) trammers; (3) hammermen; (4) timbermen; (5) other occupations, excluding surveyors and samplers.

The commission considered the question as to whether the age at which a man commenced work underground affected his liability to contract miners' phthisis but the conclusion arrived at was that this factor was not of importance. Considering the miners affected with miners' phthisis, according to the class of the disease, it was found that about two-thirds were cases of early or moderate fibrosis. In this analysis the average duration of underground work was about eight years, but in a fair proportion of cases the disease was apparent as early as after three years of underground work. In a considerable number of cases the disease was not apparent until after 13 years of underground employment. It would serve no practical purpose on this occasion to go into the question of differential liability to miners' phthisis on the part of miners born on the Rand and those born in other countries, but the conclusion is significant that the average number of years underground among the native class was shorter, which, of course, may be the result of differences in the age distribution.

Considered by subdivisions into occupational groups, the commission points out that rock-drilling miners, or machine drillers, are shown by every investigation to follow the most dangerous occupation underground. Among machine miners, out of a total of 987 men examined, 48% were found to have miners' phthisis, against 32% for the general body of miners, including machine drillers, and 21% for those who have never been employed at machine drilling at all. The average duration of underground work of machine drillers found to have miners' phthisis was only 3½ years. Considering only machine drillers who had been from nine to ten years underground, it was found that 79% had miners' phthisis, as compared with 41% for miners who, though working underground for the same period, had not been employed at machine drilling. There are important differences in the average duration of employment underground before the disease becomes manifest, but for the present purpose a discussion of these variations would not seem to be required. The general conclusion of the inquiry is summed up in the statement that "Miners' phthisis is at once more rapid, more intensive and more regularly progressive among machine drillers than among any other group of underground workers."

No Class of Underground Labor Entirely Exempt

No group of underground workers was found to be free from the serious risk of miners' phthisis and cases of the disease were found in all occupational divisions. Even surveyors and samplers were found to suffer severely from the disease and this was found to be true also of mine managers, mine captains and shift bosses. The fact that the incidence of the disease falls heavily on all classes of underground workers, not excepting the supervisory class, is considered sufficient proof that the habits of the miners, or the neglect of ordinary precautions is not a critical factor in the prevalence of the disease.

The significance and prevalence of tuberculosis as a complicating factor in miners' phthisis was made the subject

[1]See Handbook to the Exhibit on Industrial Hygiene at the XV International Congress on Hygiene and Demography by the Prudential Insurance Co., Newark, N. J., 1912.

of a special study in connection with cases presented to the Miners' Phthisis Board for compensation on the ground of employers' liability for miners' phthisis as an industrial disease. While in the general examination only 5% of the miners suffering from miners' phthisis were also found to have tuberculosis, it was ascertained by means of a special examination that the proportion was 10%, whereas in the compensation cases considered by the Miners' Phthisis Board the proportion increased to 30%. The evidence brought together proved conclusively that tuberculosis was not of common occurrence in the early stages of miners' phthisis and the facts seem to indicate that infection in the mine itself was probably not the chief source of the occurrence of tuberculosis superinduced upon existing cases of fibrosis.

Expectation of Life in Miners' Phthsis, Two Years

The expectation of life in cases showing definite evidence of miners' phthisis was approximately placed at two years. The expectation was found to be higher in cases not complicated by tuberculosis. When tuberculosis is present in cases of miners' phthisis the expectation of life is stated to be reduced to only a few months.

The conclusions as drawn from death returns do not appear to have much scientific value. The analysis was not made in sufficient detail to afford an exact method of comparison with corresponding data for certain mining districts of the United States. The average age of those dying from miners' phthisis and tuberculosis was approximately 38 years, whereas the average for deaths from respiratory diseases was 41 years. According to the investigation of deaths of copper miners in the Butte district, the average age of miners dying from tuberculosis was 43.4 years and for metal miners of Utah 45.2 years. The course of the disease in this country would, therefore, appear to be less rapid than in the mining districts of South Africa.

The final conclusions of the commission are in part summarized in the statement "That experience of the last few years has shown that the prevention of the disease is a complex and difficult problem. Although the main principles involved—an adequate supply by efficient general and local ventilation of fresh air to all working places, and the control of dust by means of water—are universally understood and accepted, the detailed application of these principles, in the elaboration of the best practical methods to secure the end in view, has proved to be far from a simple matter." The commission says further in its conclusions that:

> It is to be hoped that by the energetic coöperation of the Mines Department, the mine managements, and the miners, a systematic and uniform policy may be rapidly elaborated, which will effectively and permanently reduce the incidence of chronic lung disases among miners. Much experimental work appears still to be necessary in this direction before the best possible results can be attained. The regulations regarding dust prevention at present in force apply mainly to rock-drill and development work. But the present investigation has abundantly shown that all underground workers are exposed to serious risk of contracting the disease. No doubt this is in part due to the indirect effects of rock-drill work, and the heavier blasting charges used in connection with it, in disseminating finely divided dust throughout the mine; but it is clear that measures for the prevention of dust to be fully effective must be systematically applied, generally, and in all parts of the mine. There appears still to be urgent need for a combined experimental investigation, on the part of the Government and the mine managements, which should aim at the elaboration, introduction and operation of a uniform and systematic standard of the practical methods which should be applied to each form of mining work in detail, both in regard to general and local ventilation, and to dust prevention, in order to combat at every point the conditions which produce miners' phthisis."

On the basis of the statistical data collected by the commission, it is estimated that from 1000 to 1200 claims per annum will be made for compensation on account of miners' phthisis as an industrial disease. It is assumed that the mean expectation of life of the claimants subject to the award of compensation will be from 1½ to two years. It is recognized that this estimate is merely provisional and it is suggested that immediate provision should be made for the collection of reliable morbidity and mortality statistics.

A Distinctly Recognizable Trade Disease

There is an extended discussion of the question as to the provision necessary for insertion in any legislative measure providing for insurance or compensation against miners' phthisis. The conclusive test as to whether miners' phthisis is or is not an occupational disease in individual cases is summed up in the question as to whether the same "is so specific to the employment that the causation of the disease or injury by the employment can be established in individual cases." This "requires the disease or injury to be specific to the employment." It is not enough to show that a certain disease is known to be specially prevalent among the workers in a particular industry. Such a disease may nevertheless not be specific to the trade, since it may frequently, although more seldom, attack persons engaged in other occupations. The disease must be capable of being differentiated from other diseases as specific to the employment."

These are practically the conclusions arrived at by the English Government Departmental Committee on Industrial Diseases of 1906, and the same are accepted by the commission as sufficient for the end in view. They hold, therefore, that: "Miners' phthisis is a definite, and in its intermediate and advanced stages a sufficiently distinguishable trade disease, specific to the employment in the gold mines of the Rand," but they do not concede that a pure tuberculosis, not complicated by miners' phthisis, can be so regarded.

The commission considered the objections urged against the scheduling of fibroid phthisis as an industrial disease and subject to compensation. It goes carefully into the objections, but it adheres to the conclusion that miners' phthisis should be considered an industrial disease for which compensation should be required to be made. In many important respects this conclusion differs from those arrived at by the English Departmental Committee of 1906. The commission makes its final recommendations subject to the following requirements:

Compulsory Medical Examination Recommended

Compulsory medical examination of workmen prior to their first employment underground in this country. It became apparent in the course of our investigation that a considerable number of men had come to work in the mines, who were physically unfit for underground work on the Rand, by reason of previous disease or defective chest development. No man should undertake, or be accepted for work which is liable to produce fibrosis of the lung, unless his physical condition is good, although such a man might be able to engage in coal mining, or in other mining operations in this country, which are not carried out in hard rock. The same applies more strongly to those who show signs of previous chest disease, and it is evident that any man already affected by pulmonary tuberculosis, or by fibrosis of the lungs, should not, in his own, and in the public interest, be permitted to engage in underground work. Taking into consideration all the circumstances regarding the serious incidence of lung disease among miners on the Rand, we should recommend that any man, applying for the first time to be employed underground in any mine, in work which is liable to produce fibrosis of the lungs, should be the bearer of a medical certificate, signed by a duly qualified medical practitioner, that he is: (1) Of good physique, and capable of undertaking underground work in hard-rock mines, and (2) that he is free from pulmonary tuberculosis and fibrosis of the lung.

It should be an offense thereafter to employ any man who does not hold such a certificate, stamped with the name of his first employer and the date of his first engagement. It should be at the option of the employer to require, that an applicant for work should be examined and certified by a medical practitioner designated by the employer, at the expense of the latter. Further, every workman applying for a "blasting certificate" should be required to produce

such a medical certificate, in the same manner as is prescribed for applicants for a certificate as engine drivers.

The commission considered the need of a suitable classification for degrees of incapacity or disablement, but it may be questioned whether such refinement of methods would really serve a useful purpose in actual experience. This difficulty is recognized by the suggestion for the appointment of a board of medical referees, consisting of members with special previous experience of the disease. The principle, however, is an admirable one, for compensation would be according to the stage of the disease, and the same should take the form of a pension or annuity. Finally, the committee recommended that "No man who has received compensation, owing to his being affected by miners' phthisis in any stage or degree, should be permitted to resume work underground at any time."

Facts More Needed than Mathematical Discussion

Appended to the report is an extended statistical-mathematical discussion and a number of tables and diagrams. It must be considered a matter of sincere regret that the facts regarding miners' phthisis were not presented in more detail, in place of a discussion of mathematical methods and conclusions largely outside of the understanding of the average mine manager, physician or engineer. It is possible, of course, that the commission may subsequently publish the evidence secured in detail and give the actual numbers, together with the percentages, so that the statistical value of the data may be judged by those in a position to use them. By whatever means or methods the problem of miners' phthisis may be solved, it will certainly not be along the lines of mathematical speculation and by refined methods of statistical analysis. A useful appendix to the report is the schedule used for the examination of miners, which should be found suitable for the purpose of a possible future inquiry of this kind in the United States. The report is a most valuable contribution to the literature of the subject and marks a distinct step in advance in the commendable effort to arrive at the facts essential to the adoption of really effective methods to reduce the incidence of miners' phthisis to a minimum.

The value of the gold production of certain districts in Alaska is estimated by the U. S. Geological Survey as follows: Fortymile and Seventymile districts for 1911, $212,000, an increase of $12,000 over 1910; Fairbanks district for 1911, $4,500,000, a decrease of $1,600,000 from 1910; Circle precinct for 1911, $350,000, which exceeds any other year since 1898.

Mining Machinery Exhibit in London

The mining-machinery exhibition to be held at the Royal Agricultural Hall, Islington, N., from May 29 to June 7, 1913, is the fifth of the series organized by Messrs. Montgomery. An association of leading manufacturers in the industry has been formed, and these exhibitions will now be quinquennial, so that after next year's there will not be another exhibition until 1918. This arrangement both prevents an undue tax on the manufacturer through the multiplicity of exhibitions, and enables each to be thoroughly representative. Already three-fourths of the available space has been taken up. A committee has been formed to supervise demonstrations of life-saving apparatus and devices, to organize lectures on subjects of immediate importance to those engaged in mining operations, and to secure the attendance of British, Colonial and foreign representatives of mining institutes.

The committee consists of W. E. Garforth (President of the Institution of Mining Engineers); Sir Ralph Ashton; Prof. J. S. Haldane; Sir Henry Hall; Sir Thomas H. Holland; A. M. Lamb; H. C. Peake, past president, I. M. E.; and H. L. Sulman, past president, I. M. M. Lectures have already been promised by Sir Henry Cunynghame, Professor Haldane, and other well known authorities. The offices of the exhibition are at 43 Essex St., Strand, London, W. C.

United States Uranium Production

According to the Bureau of Statistics, oxide and salts of uranium to the value of $10,176 were imported in 1910, and to the value of $14,106 in 1911. This is one of the comparatively few mineral products of which the United States ships the raw material abroad to be imported again in manufactured form. Except that incidentally taken out in mining carnotite for vanadium, but little uranium was mined in the United States in 1911. A few hundred pounds of pitchblende were mined by the German Gold & Uranium Mining Co., at Central City, Gilpin County, Colo., but it is understood this material was not sold, but was used by the company in experimental work. The company also owns the Belcher mine, which has produced some pitchblende. There are other mines in the same group which are said to produce pitchblende, of which the Kirk is probably the largest, but figures of production have been refused. In North California a few hundred pounds of pitchblende, part of which is altered to gummite, an oxidation product, has been saved in mining feldspar at Benland.

The uranium in the carnotite ores mined in 1911, amounted to about 25 short tons of U_3O_8, or 21.2 tons of metallic uranium. As nearly as can be ascertained, about half of this quantity was shipped abroad in the form of ore.

The popular interest in uranium is due almost entirely to its connection with radium. Radium extraction has been attempted in the United States by several persons and firms. Some of these have given up their efforts, but others are still at work.

Outside of its uses as a chemical reagent and for yellow glazes on pottery, the chief use of uranium is for making yellow glass. The so called canary glasses are radioactive to a high degree, but they are expensive, as much as 20% U_3O_8 being required to get the color used in incandescent electric-light bulbs, according to the U. S. Geological Survey.

The attempt to use uranium in steel has been given up by some firms which have experimented with it, the claim being made that it imparts apparently much the same properties as does tungsten, and is much more expensive. Other firms, however, appear to be still pursuing such experiments.

Reinforced Platinum Ware

The use of one of the strong metals of the iron group as a backing to reinforce platinum is recommended by Byron D. Eldred, of Bronxville, N. Y. (U. S. pat. 1,043,576). His idea is that the two most useful properties of platinum are its resistance to acids, and its infusibility The first is given by the platinum surface of the compound metal, while the metals of the iron group are of sufficiently high melting point to retain the property of infusibility.

The method of binding them is to heat the base metal through the platinum sheet with an oxygen or enriched-air flame to surface melting of the base metal, then arresting the heating, as welding will begin at that time. Both metals must be clean, of course.

Another patent (U. S. pat. No. 1,043,579) covers the manufacture of spun ware from compound sheets, double-faced with platinum, made as provided in the previous patent, and then covering the exposed base metal edge by drawing over some of the platinum, or by fusing in a platinum strip.

Another patent contemplates producing these bimetallic plates by casting the ferrous metal, superheated, against the platinum (U. S. pat. No. 1,043,577). Preferably this will be done in a U-shaped mold, casting the metal down through borax or a similar flux, and allowing it to rise in the other leg, against the platinum surfaces. The production of the superheated ferrous metal by reduction of iron oxide by alumina is also covered.

Addicks Method of Making Brass

A new method of making brass has been patented by Lawrence Addicks, of the U. S. Metals Refining Co., Chrome, N. J. He states that the objection to the present method of making brass in crucibles is the high cost of the crucibles in depreciation and breakage, and the high cost of labor, owing to the small-size scale on which operations are conducted. The objection to brass making in reverberatory furnaces is the excessive loss of zinc due to volatilization and the difficulty of maintaining a uniform grade in the brass produced.

His method is to draw copper from the ordinary cathode-melting reverberatory into a ladle, say of two or three tons capacity, and quickly introduce therein the desired quantity of zinc. The two or three tons of brass are then promptly poured off from the ladle and cast into ingots or whatever shape is desired. The molten copper will be delivered to the ladle at no greater cost than to the molds in which copper ingots are cast. Therefore the entire cost of brass making will be simply the cost of materials, plus whatever zinc loss is involved, plus the ladling cost. The quantity which can be handled to advantage at any time will be determined by the loss of zinc that is encountered; a suitable amount seems to be from one to three tons.

Some Properties of Lime

Recent experiments have shown that hydrated lime will not keep any better in air than ground quicklime, says the U. S. Geological Survey, and it has not been proved that hydrated lime may be stored indefinitely without its spoiling. In the crushing- and tensile-strength tests it has been found that magnesian limes were stronger than high-calcium limes. Although this may be of some advantage in structural work, it is known that high-calcium lime possesses the requisite strength for nearly all practical purposes.

The minimum dissociation temperature of calcium carbonate is found to be 880° C. and of magnesium carbonate 750° C. The maximum temperature permissible for burning pure high-calcium limestone is above 1300° C.; for impure high-calcium stone it lies between 1050 and 1150°, and for pure magnesium stone between 1000 and 1050°, and for impure magnesium stone between 900 and 1020°. The more porous a limestone is in its natural condition, the more easily will it burn; that is, the more rapidly and at a lower temperature. Porous stone may be completely burnt at 900° C., whereas a denser stone requires at least 1000° C. for the same length of time. Other things being equal, the lower the temperature at which complete decomposition may be brought about, the better will be the lime. In general it may be said that high-calcium lime will slack faster than dolomite lime, and will also require more water for slacking than do the dolomite limes.

Unskilled Labor

The question of the unskilled laborer has become so pressing a one in railway work that the Roadmasters and Maintenance-of-Way Association had a committee report on the subject at its Buffalo convention, Sept. 10 to 13, 1912 (*Eng. News,* Nov. 21, 1912). Some of the report seems as applicable to mining and metallurgy as to railroading.

Obtaining Laborers

Where it is possible, the laborers should be obtained locally by the foreman. If the required number cannot be secured this way, the company should maintain a labor bureau of its own at some central point where laborers assemble to seek employment. Let it be the policy of these labor bureaus to furnish free employment, free transportation, and, when necessary, send a company representative with the men to their destination and turn them over to the foreman for whom they were engaged, without any first cost to them either legitimate or extortionate. By this means the man so employed will realize that upon his own individual energy will materially depend how long he will be retained in the service.

Obtaining laborers through the regular employment agencies is not always satisfactory, due to the fact that through eagerness to secure a shipment of laborers and earn the fee connected therewith, the labor agent too often makes promises of various kinds that cannot be fulfilled.

The method is discouraged of obtaining laborers through such men as interpreters, book men, commissary men, etc., on promises of appointment as interpreters, subforemen, and timekeepers for the gang, or allowing boarding-house privileges for the purpose of furnishing meals and lodging to the laborers furnished. Usually the interpreter extorts a certain amount of money from each green foreigner for whom he secures work on his assurance of steady employment. He thus practically binds himself to keep these men at work regardless of their fitness or unfitness. The sole interest that the commissary man has in the labor he supplies is to extract every penny possible by charging exorbitant rates for provisions, which the laborers are compelled to purchase from him, and extortionate rents for small and unsanitary sleeping quarters. There is no hope of ever getting any satisfactory results under this system.

Shanties of suitable size with good light and ventilation should be provided, with sleeping rooms separate from the living rooms, particularly if the men do their own cooking. All shanties should be furnished with necessary lamps and a heating or cook stove as required.

The sanitary conditions are most important. Necessary toilets must be maintained. A foreman in charge should closely watch these things and insist that the buildings occupied and used by his men are at all times kept neat and clean, and that the grounds surrounding the building are also kept tidy. A great deal of the local prejudice against foreign labor is due to the filthy habits that on the surface seem to be general among the men.

Handling the Men

It is not an easy task to make good men out of Italians, Japanese, Greeks and Mexicans. It is still more difficult to teach men to speak and write the English language.

The first thing is to obtain the confidence of the men. Avoid abuse. Explain as clearly as possible just what is to be done. Make no promises that cannot be fulfilled. Allow full time for every moment worked. Give liberal allowances of time and proper food when working overtime in emergencies in stormy weather. Keep them always under submission by granting no concessions when a threat to quit accompanies the request. Teach them to become law-abiding citizens. Do not permit them to carry or possess any kind of dangerous weapon. Accustom them to the idea of keeping their home surroundings neat and sanitary.

Explain how best to make purchases of clothing and provisions so that they won't be deceived by men of their own nationality who may have been somewhat shrewder than they and have started small stores for this purpose. Aid them to learn the English language by circulating the names of the various tools and equipment they come in contact with every day.

There is no question but that there is local prejudice against foreign laborers. This can be overcome to a great extent by educating the men to endeavor to live as the average American does. They should be taught by example to be honest and truthful in all their dealings and to observe closely and to pattern after the general run of good American citizens. Give them to understand that this is a free country and that, as long as they conform strictly to its laws as other men do, and as long as they do not become a nuisance to the community in which they live, it is not necessary for them to pay for the privilege of earning an honest living.

Lithium is the lightest known solid element and has a specific gravity of 0.585. It is soft, not tenacious and has no known valuable properties.

Flotation Process at Kyloe, N. S. W.

The oil-flotation process as used at the Kyloe copper mine, near Cooma, N. S. W. Close sizing and feeding are necessary. Too much clay renders the process inoperative. Stage flotation practiced, the flotation surface being successively decreased.

Note—Abstract of a paper by J. W. Ashcroft, in Bull. No. 97, I. M. M., entitled "The Flotation Process as Applied to the Concentration of Copper Ore at the Kyloe Copper Mine, New South Wales."

The ore in the Kyloe mine, 32 miles from Cooma, N. S. W., at the time flotation was adopted, consisted of quartz with chalcopyrite and small amounts of bornite and iron pyrites. A typical sample of clean hand-picked ore gave as follows: Cu, 21.2%; Fe, 24.3; SiO_2, 28.9; S, 25.1%; Bi, Ag, Au, trace.

In places the orebody occurs as small veins in a crushed feldspathic filling. A clay seam, or gouge, varying from 1 in. to over a foot, occurs in the ore channel throughout the workings. This clay, and that derived from the kaolinizing of the feldspathic portion of the granite filling, was the cause of considerable trouble in the flotation treatment. A remedy was subsequently found in the addition of a large proportion of clean quartzose ore.

Original Treatment

Originally the ore was hand-sorted at the shaft bins, waste eliminated and some clean ore taken out for shipment, and the remainder sent through a rock-breaker and crushed to 1½ in. It then went to a picking belt, and after picking over, the remainder, carrying 5 to 5½% copper, goes to the mill bins. A typical analysis is: Fe, 6.5%; Cu, 4.7; S, 5.2; CaO, 3.4; insol., 79.4 per cent.

From the mill bin the ore was fed mechanically into an elevator, which discharged into a shaking screen. From this, the oversize was fed, with water, into a set of Cornish rolls, and the undersize went to a May jig. The head product from this jig was dried, bagged and sold to a smelter, the tailings went to waste, and the middlings were reground wet in a ball mill, and after classification, passed over Wilfley and Card tables, the overflow from the classifier being thickened in a pulp thickener, from which a spigot delivered to a Frue vanner, and the overflow went to waste.

For about 18 months the mill recovered 74% of the copper in the mill feed in a concentrate carrying 19 to 20% of copper. The concentrate had formerly been smelted to a 50% matte, but owing to increasing cost of firewood, fluxes, etc., it has been found more profitable to sell the concentrates to a smelter. Freight on these concentrates was $8.50 per ton, therefore it was essential to produce a high-grade product. By lowering the grade of the concentrates, a higher extraction could be obtained, but the extra cost of transport, and the smaller prices paid by the smelter, made it more profitable to ship a concentrate carrying at least 20% of copper.

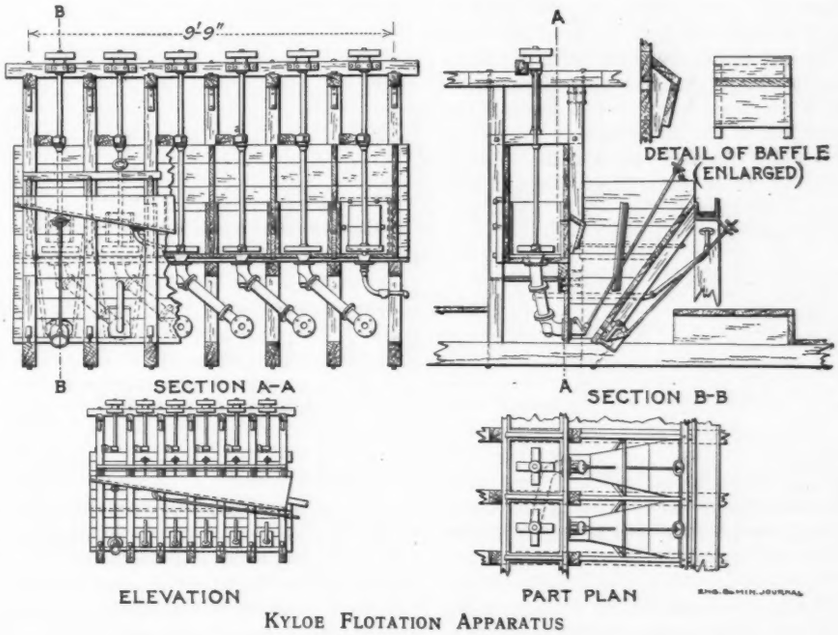
Flotation Experiments

The old concentrating plant was left untouched, so that work could be begun again at any time, and an experimental mill erected. This was divided into two sections, one for grinding, and one for flotation. The grinding was effected in two 8-ft. classifying-discharge Forwood-Down pans, driven at 30 r.p.m. The flotation machine was the latest type used at Broken Hill on zinc-lead seconds, with six stirring boxes, each 16 in. square.

The first departure from the former method of concentration took place at the jigs. The first hutch product was a clean concentrate as before. The second and third hutch products were dressed on a No. 5 Wilfley table, also as before; the tailings from this Wilfley, together with the No. 4 hutch product and the jig tails, were sent to the grinding pan, and the overflow from the classifier at the head of the jig, together with the overflow from the end of the jig, passed through a pulp thickener of the baffleboard type, the spigot from which discharged into the launder running to the flotation machine, together with the discharge from the grinding pan.

The flotation machine as shown in the accompanying illustration, consists of a series of six square boxes fitted with revolving impellers and each box connected to an outside chamber in which the separation of the mineral from the gangue takes place. From the bottom of the No. 1 flotation chamber, the pulp is drawn by the action of the second impeller into the No. 2 box, and from No. 2 flotation chamber into the No. 3 box, and so on, the pulp from which the mineral has been separated being finally discharged from the bottom of the No. 6 flotation chamber.

The flow from the flotation chambers through the diagonal pipes into the stirring boxes is regulated by a valve on the top of each pipe, and the tailing discharged by a similar valve. In the flotation process as used at Kyloe, no acid is required and the entire operation is conducted at ordinary temperatures. The oil used is crude eucalyptus oil containing a large percentage of phellandrene. This oil is manufactured in the district and costs 17c. per lb., f.o.b. mine.



Kyloe Flotation Apparatus

The pulp thickener was an adaptation of a well known type and calls for special attention, being of cheap and simple construction and working admirably. The details of the apparatus are shown in third illustration.

Defects in the Original Plant

A number of defects soon revealed themselves in both sections of the plant. In the flotation machine the original slicing valves used were not sufficiently sensitive to regulate the flow properly, the correct adjustment of which through the different boxes has an important bearing on the successful working of the process,

and the slicing valves were, therefore, replaced by flat valves operated by a rod with threaded end and handwheel, which arrangement proved satisfactory and permitted delicate adjustment.

As soon as work was started, it was found that, owing to the flotation chambers being all of the same width, while the amount of mineral to be floated became less in each one toward the tail end of the machine, the froth became thin and poor after the first two boxes. To remedy this and give the froth a greater density and thickness, the flotation chambers were contracted on top by means of "crowding boards," which reduced their surface to widths varying from 11½ in. on No. 1 to 4½ in. on No. 5. No. 6 chamber was shortened by putting in a water-tight bulkhead in addition to the crowding boards, as in the other chambers. This narrowed the surface to 4 in. and shortened the distance through which the poor froth had to travel by one-half and gave less chance for the mineral to drop away from the froth into the tailings before it was delivered into the discharge launder.

The machine now appeared to work fairly well, but samples taken from the discharge lip of each of the flotation chambers showed that the products from Nos. 4, 5 and 6 chambers were not sufficiently rich to be profitably shipped, so the concentrate launder was divided and arranged so that the products from Nos. 1, 2 and 3 chambers went to the concentrate bin, while those from Nos. 4, 5 and 6 were returned to No. 1 box in the machine and were re-treated.

SAMPLES FROM FLOTATION MACHINES

Chamber	Cu	SiO_2
No. 1 overflow	27.2	21.2
No. 2 overflow	24.1	41.5
No. 3 overflow	22.3	59.6
No. 4 overflow	15.6	61.0
No. 5 overflow	14.3	60.7
No. 6 overflow	9.4	68.7

After a short run it was also found necessary to insert iron liners in the stirring boxes as the wooden ones wore away rapidly. The opening into the boxes through which the pulp was drawn by the action of the impellers was made bell-mouthed, which also improved the working considerably. Inspection doors were provided so that the wear could be ascertained without dismantling the boxes. As soon as the machine was working normally after these operations, samples of the feed and tailings were taken regularly, the result of a week's run being as follows: Average feed, 4.4% Cu.; concentrates, 21.6% Cu; tailings, 1.9% Cu; recovery, 61.8 per cent.

This, although an improvement, was not satisfactory, so sizing tests of the feed were made to discover, if possible, in what direction to look for further improvements. The results are shown in the accompanying table.

These figures indicated that the material being fed into the flotation machine was not sufficiently uniform, and that it contained too large a quantity of comparatively coarse particles which could not be held up in the froth and which in falling would carry down some of the finer particles, which would otherwise have remained suspended. Improvements, therefore, lay in the direction of finer grinding and closer sizing. As the sizing test showed that an unduly large percentage of material larger than 40-mesh was contained in the ground pulp, the discharge of the grinding pans was slightly raised and the product again sized, with the result that, while the quantity of slime found was largely increased, the amount of product larger than 40 mesh was but little reduced.

The working of the machine was still unsatisfactory, the recovery in the whole mill being only a little better than with the old system, but as all laboratory tests showed that a much better extraction was possible when conditions were favorable, and as the trouble in this case appears to be purely mechanical, it was decided to rearrange the whole of the flotation plant, so as to remedy the most apparent defects, which were: The excessive amount of oversize in the feeds of the stirring boxes; excessive dilution of the pulp; irregularity of the overflow in the flotation chambers, due to irregularity of the feed, and of the speed of the impellers; the want of proper means to control the supply of oil.

SIZING TESTS ON FLOTATION FEED

Mesh	Feed		Concentrates		Tailings	
	% weight	% Cu	% weight	% Cu	% weight	% Cu
+20	1.52	2.20	0.18	17.5	1.85	2.0
+40	13.17	1.20	0.30	17.0	17.53	1.2
+60	15.10	0.80	0.31	18.5	20.77	0.7
+80	3.55	1.15	0.52	24.7	6.10	0.6
+100	22.50	1.40	7.42	53.6	21.40	0.6
+130	3.62	3.80	1.55	21.2	4.20	0.5
—130	40.40	5.45	89.60	23.75	28.00	1.2

Rearrangement of Flotation Plant

In order to remedy the defects mentioned, the old mill was put in commission, while the following alterations were made: The grinding pans were altered from the classifying discharge to the positive feed tank and were arranged to discharge on revolving screens, so as to keep the feed to the flotation machine more even in size. The pulp thickener was moved and placed between the screens and the flotation machine, so as to keep an even feed to the stirring boxes and to regulate its density. The flotation machine was connected to a separate engine with a sensitive governor so as to keep the speed of the stirrers constant. An apparatus was made for adding the oil to the pulp in such a manner as to insure an even flow. On the revolving screens were tried Greening's L. W. C. screening cloth, 600-mesh, with apertures 0.0268 in., and A. K. D. cloth, 900-mesh, with apertures 0.0217 in. The L. W. C. was found to last longer and to give equally good results, and so was finally adopted. The screens last about 10 weeks for each covering.

The method of adding the oil to the pulp, which was finally adopted, consists in placing two drums, one above the other; in working, the top drum is filled with oil, and the flow from this to the lower one is regulated by a floating ball valve, thus insuring a constant head in the lower drum. From the lower drum the oil drops at a constant rate into the launder which carries the pulp from the screens to the flotation machine, at the rate of about one drop per second, amounting to 0.65 lb. of oil per ton of dry ore treated. In the rearrangement of the plant, no concentrating tables were used, but the whole of the product from the jig, excepting that from No. 1 hutch (which was bagged for shipment) was sent to the flotation plant in order to give a larger percentage of mineral there, and so form a thicker froth in the flotation chamber.

Having remedied the defect in the grinding plant, the flotation machine began to do better work, the result of a six days' run being as follows: Feed to stirring boxes, 4.5% Cu.; concentrates, 23.9% Cu; tailings, 1.22% Cu; extraction, 76.3% Cu. The extraction percentage was worked out by the following formula:

$$\frac{\frac{A-B}{C-B} \times 100\,C}{A}$$

where A equals percentage of copper in feed; B equals percentage of copper in tailings; C equals percentage of value in concentrates; a convenient formula for approximate estimation when it is impracticable to weigh the product.

Clayey Feed Gave Trouble

It was soon found that a certain type of feed gave bad results; that is, where there was a large percentage of oxidized and kaolinized lode matter, and in the week under review the tailings value for the last three days averaged 1.47% Cu from this cause. On one occasion, when there was sufficient of this deleterious material to color the pulp a dirty yellow, practically no flotation took place, the pulp leaving the boxes at approximately the same value as it had when fed in. There was no true froth, only large shiny bubbles and a little coagulated sulphide,

which overflowed the flotation chamber. Samples taken from each chamber at this time gave the following results: Feed, 3½% Cu; chamber No. 1, 9.3% Cu; No. 2, 8.2% Cu; No. 3, 6.3% Cu; No. 4, 7.4% Cu; No. 5, 6.5% Cu; No. 6, 8.8% Cu; tailings, 3% Cu. The films forming these large bubbles were slimy and tenacious and no improvement took place while the feed was discolored in this way.

Effect of Slimy Feed

Tests made indicated that the deleterious effect was due to physical rather than to the chemical properties of the material, and to the peculiar nature and excessive quantity of the slime produced by it; in order to determine definitely what effect the large quantity of the slime had upon the working of the process, daily sizing tests were made of the feed to the flotation machine extending over a considerable period, and these showed that when this contained more than 40% of — 130-mesh, the quality of the work began to fall off, while the best results were obtained with from 29 to 30% of this size in the feed.

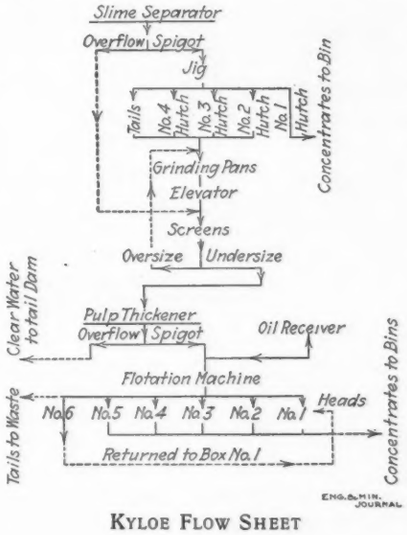
Since the trouble which arose from "dirty" ore, the mill feed has been regulated so as to contain only a small percentage of this in the total feed; and the result has been uniformly good. Only occasionally the separation becomes poorer, and this can now be quickly corrected by the man in charge who can tell by the appearance of the froth what the conditions are. Once running in proper order, the machine is easy to regulate and will sometimes run for 48 hr. without being touched, but at other times, if the character of the feed changes it will require frequent adjustment until the feed is again regular in composition.

A week's run under the new conditions shows as follows: Feed, 3.6% Cu; concentrates, 24.4% Cu; tailings, 0.79% Cu; extraction, 79.6%. These figures show a better recovery than is obtainable by any other known concentrating process on this class of ore, and when it is remembered that, in the case of the Kyloe ore, the mineral contained is nearly pure chalcopyrite, the tailing values are very low.

Drying the Concentrates

The concentrates made are in a fine state of subdivision, and are frothy. Filtration was tried as a means of getting rid of the water, but proved a failure without the aid of presses or vacuum plant. It was found, however, that by running the material into a tank and spraying the surface, the froth was broken up; the introduction of a baffle board at the overflow into the tank caused the mineral to settle and allowed an overflow of clear water. There are two of these tanks in use and concentrates are settled in them alternately. The water is run off as closely as possible, and the wet concentrates then shoveled out onto a drying floor heated from underneath, and from there, when sufficiently dry, are shoveled in the bins ready for bagging. The plant has been in successful operation for six months, at the time of writing this article. The mill recoveries from July 29, 1911, to Jan. 27, 1912, were as follows: Ore treated, 7855 tons; copper content, 411.97 tons; assay, 5.24% Cu. Concentrates made, 1562 tons; copper content, 355.79 tons; assay, 22.65% Cu; extraction, 86.36 per cent.

The recoveries are those for the whole concentration plant, and are worked out from the weights and values of concentrates made and shipped as against the daily assay for the mill feed. The actual recovery in the flotation plant, apart from the jig, is approximately 80% on a 3½% feed, and the assay value of the flotation concentrates is over 25% Cu. It is as well to state here that it



Kyloe Flow Sheet

has been proved by experiment that the extraction could be increased to 90% or over by lowering the grade of the concentrate; but, as has already been explained, owing to the high transportation charges, there is more profit in making a higher grade product, even though so doing involves a smaller recovery. The actual cost for the 24 weeks, from July 3, 1911, to Dec. 16, 1911, were as follows: Ore milled, 8556 tons; residues treated, 5732 tons.

The costs shown in the accompanying table include relining the stirring boxes with iron liners instead of the wooden ones originally put in, and include, also, some alterations to the pans, which makes the items "maintenance and renewals," appear high. The cost of oil, which is included under flotation, is 10.5c. per ton of residues treated, or 7c. per ton of ore milled. The total cost of milling for the period, including crushing, belt picking, fine crushing, jigging, regrinding tailings and flotation, together with all maintenance and cost and proportion of general expense, was $1.877 per ton, and the cost of delivering the ore from the mine to the mill bin was 6.7c. per ton. The royalty paid is saved by the Kyloe company in the lesser tolls charged by the smelters due to the higher grade of concentrate shipped. During the first three months of the period shown in the table, a portion of the jig residues was run to waste, as owing to lack of power, the pans could not treat all of them. This has since been remedied, and the total cost per ton of residues treated is now only about 10% over the cost per ton of total ore milled.

The mine is a small one and the tonnage available for treatment is also small, that is, 60 tons per day, and the costs are, therefore, higher than they would be on a large tonnage; but owing to there being no acid required, no heating of solution and to the more favorable conditions existing at Kyloe, the flotation costs are considerably lower than they are at Broken Hill, where the process is worked on zinc-lead tailings. The cost of plant will necessarily vary with local conditions, but owing to the small space occupied and the simplicity of the apparatus employed, it will probably cost 25% less to install than a corresponding wet dressing mill with tables, slime plant, etc.

Cost of Flotation Process

Departments	Per Ton of Ore Milled	Per Ton of Residues Treated
Regrinding, screening and flotation	$0.316	$0.470
Power	0.947	0.069
Drying and handling concentrates	0.077	0.115
Maintenance and renewal	0.134	0.198
Assaying, lighting, etc	0.046	0.069
Water supply	0.069	0.103
Superintendence and general expense	0.042	0.066
Total, excluding royalty	0.731	1.090
Royalty	0.121	0.182
Total cost	$0.852	$1.272

Conditions for Successful Working

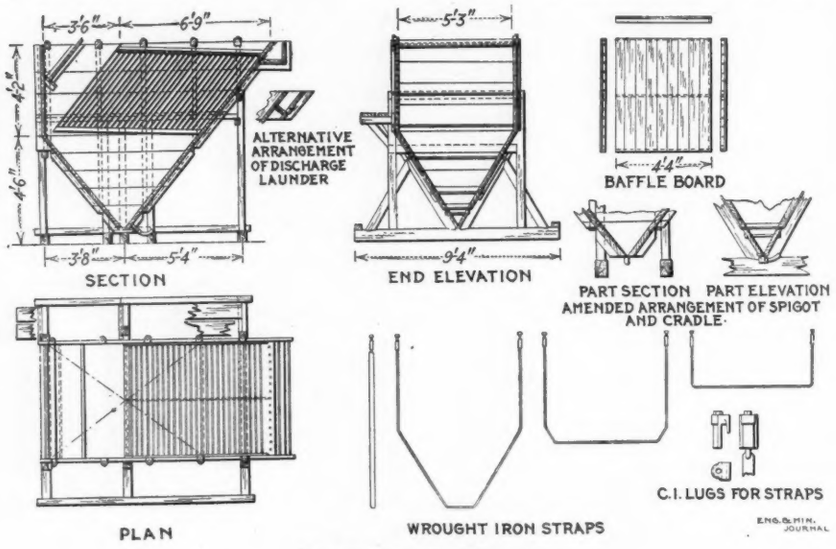
So far present experience indicates that any clean sulphide can be treated if the physical conditions are right. These conditions are: That the particles must be clean and free from oxidization; that the gangue must not be of so clayey a nature as to form a fine slime, which coats the surface of the sulphide particles and prevents their attaching themselves to the bubbles formed, or which, in itself, forms too large a proportion of gangue slime which comes up with the froth and destroys its holding power for the sulphide. The material to be treated requires to be ground as evenly as possible. The best size must be determined on each individual ore. The feed and speed of the stirrer must be correctly proportioned and kept as even as possible. The thickness of pulp fed into the machine must be regulated and kept as even as possible.

The minimum amount of floatable material required to be present in the ore

has not yet been determined. At Kyloe it amounts to approximately 10% of the weight of the ore, and this gives excellent results. Experiments are now being made to determine, if possible, the minimum amount allowable. Any excess can, of course, generally be removed by jigging or by some other form of concentration before flotation.

In some cases, the addition of clean pyrites may be beneficial, but as the successful float depends largely upon the total quantity of minerals rather than the percentage in the ore, it is, in many cases, possible, by keeping the float back in the flotation chambers, to treat successfully very low-grade material. This, however, must be tested on each ore separately.

The quality of water used has a marked effect on the process and necessitates modification according to its hardness and chemical constituents, but bad water is not necessarily detrimental to the working of the process.



KYLOE PULP THICKENER

The machines as now used are a great improvement on the old type of pointed boxes and will no doubt be further improved as experience suggests modification.

The grinding of the ore to prepare it for flotation may be done in nearly any form of machine, provided it does not make too much slime, although the process can work successfully with a considerable quantity. The best type of machine is one which screens the material as soon as it is crushed and returns the oversize. The ideal to be aimed at is to keep the particles as nearly of a size as is practicable.

In the foregoing the poor success at the starting of the process has been dealt with rather fully, for the reason that the experience gained therefrom may be of use to others when starting a new plant, and following up the various causes of trouble may assist in locating weaknesses in other installations.

Tomboy Gold Mines Co., Ltd.

The report of the Tomboy Gold Mines Co., Ltd., operating mines in the San Juan district of Colorado, for the year ended June 30, 1912, showed that 107,577 tons of ore were milled, at a total profit of $450,941. The bullion yield was at the rate of $8.87 per ton, while the cost was $4.69 per ton. Two dividends, totaling £31,000, were paid during the year.

At the Argentine mine no advance development work was done, for the reason that all efforts were centered on opening the newly acquired Montana mine. The ore reserves in the Argentine mine are estimated at 340,000 tons, of which 230,000 tons are broken ore in stopes.

General Manager D. A. Herron states that a year's operation on the Montana mine has confirmed the estimate that no extra equipment other than the installation of an air-compressor plant would be required. The covered surface tramway connecting the portal of the Ophir tunnel with the portal of the 1760-ft. level of the Argentine mine, and equipped with electric haulage, permits of the housing of Montana miners at the Argentine boarding house, the sharpening of all tools at the Argentine blacksmith shop, and the making of all repairs at the Argentine machine shop. Montana ore is also transported over this tramway into the Argentine mine, hoisted through the Cincinnati shaft, a distance of 90 ft. to the 1650-ft. level, and trammed thence to the 60-stamp mill. It is believed that the Montana mine can be operated with but little additional cost to the expense of operating the Argentine mine alone. Owing to the necessity of doing a large amount of dead work before any advance could be started, only a comparatively small amount of new territory was opened.

The ore occurrence in the Montana mine is analogous to the orebodies of the Argentine, differing only in the fact that the metals are more generally disseminated throughout the vein, varying vertically and longitudinally in a distance of a few feet. In the course of development of the Montana mine, 21,702 tons of ore, averaging $10.50 in gold and silver, were mined and treated at the mill. Inasmuch as this tonnage included quantities of waste, it is expected that the original estimate of the value of the ore is going to be fully maintained, if not exceeded.

Important changes in the milling practice were made during the year, with the view of increasing the capacity and efficiency of the mill. By remodeling the concentrator and the addition of new equipment the number of Wilfley tables working on primary feed was raised from 11 to 22. A grading plant, consisting of three Wilfley tables and one Deister slimer, was erected. This plant receives the mixed concentrates of the primary Wilfley concentrators and the entire concentrated product of the Frue vanners, and turns out a finished product of high-grade lead (over 60%), assaying high in gold; a zinc concentrate containing 24% and higher of zinc, and an iron product which, under the modified smelter schedule, commands a much more favorable price for gold, silver and lead than when, formerly, the iron was included in the zinc concentrate.

A middlings plant was also designed and erected for the retreatment of the higher-grade portion of the tailings discharged from the Wilfley roughing tables and the high-grade tailings from the primary Wilfley tables. The plant consists of two Hardinge conical tube mills for regrinding, eight copper plates for re-amalgamation, classifiers, seven Callow tanks, seven Deister slimers, and eight Wilfley tables for the re-concentration of the re-ground middling products. For the relief of the filter plant this year, four Dorr thickeners are to be installed.

Spellerized Pipe

Spellerized pipe has been on the market for some time, but no explanation has heretofore been offered as to what the process consisted in. The method is now explained by the National Tube Co. as follows: Spellerizing consists in subjecting the heated bloom to the action of rolls having regularly shaped projections on their working surface, then subjecting the bloom while still hot to the action of smooth-faced rolls, and repeating the operation, thereby working the surface of the metal to a uniformly dense texture, adapted to resist corrosion, especially pitting.

This process is, of course, of most service on 4-in. pipe, or smaller, because of the thin walls. The larger sizes, because of their thickness, do not require so much extra work of this character.

Electrostatic Separation of Barite and Sphalerite

Many suggested processes for the separation of sphalerite and barite have failed, the chief cause of failure being the varying physical characteristics of the ore. As the result of a series of experiments performed by C. C. Conover[1] and E. R. Morris[2] at the Missouri School of Mines and Metallurgy for their graduation thesis, the following process was outlined. The essentials are these: Ordinarily sphalerite and barite are nonconductors of electricity; when an ore containing these minerals is leached with dilute copper sulphate solution, the sphalerite becomes a good conductor and can be electrostaticly separated from the barite which is unaffected.

For the experiments a hand-jig concentrate consisting of barite and sphalerite with no pyrite or galena was used. It came from a mine in central Missouri and had not been successfully treated by any process. The apparatus used in these tests was a small one-roller separator made to resemble the Huff roller-type electrostatic separator; electrification was accomplished by an ordinary Holtz electrostatic machine. A small motor was used to drive the apparatus.

Preliminary tests were made to determine the effect of various strengths of copper sulphate solution, time of treatment, sizing of feed, temperature of the bath, washing out the solution after treatment, and the effect of no treatment. The conclusions reached were: The ore must be treated to effect a separation; the ore must be closely sized; the temperature and strength of solution and the time of treatment are not important; copper solution remaining after the wash hinders the separation.

Further tests showed that the deposition of the conductive film upon the sphalerite was rapid, even at room temperature. A lot of ore was treated for one minute with 1% copper sulphate solution at room temperature, immediately washed, dried and separated with entirely satisfactory results.

To determine whether deposition would go on to completion in extremely dilute solution, copper sulphate equal to the amount found to be consumed by five kilograms of ore in a previous experiment was dissolved in 1200 c.c. of water and used in leaching the given quantity of ore. The procedure was made to resemble treatment in ordinary bins by pouring the solution over the surface of the ore and letting it drain off through openings in the bottom as waste water.

After this treatment the ore was dried and screened into four sizes: +20 mesh, +40 mesh, +80 mesh and —80 mesh. The separation of the +20 mesh product gave the following results: Feed, 19.38% zinc; concentrate, 63.75% zinc; middling, 24.64% zinc; tailing, 0.61% zinc; recovery (counting middling lost), 92.8%; recovery (counting middling recoverable), 97.8%. The middling was not separated into tailing and concentrate as it was too small in bulk. Its behavior, however, indicated that it would separate as well as the rest did. Separations of the other sizes gave results equally as good, the dust separating nearly as well as the coarser materials. Analyses of solution used are as follows: Original solution, 0.111% Cu; resulting solution: 0.006% Cu; 0.164% Fe; 0.056% zinc. The copper used in this experiment was at the rate of 2.1 lb. of crystallized copper sulphate per ton of ore. This figures about 10c. per ton for treatment charges above those incurred in the electrostatic separation.

The final conclusions were that sphalerite and barite can be separated by this method, which consists in treating the ordinary concentrate from wet concentration with an extremely dilute solution of copper sulphate, drying, screening and separating by electrostatic means. The effect of abrasion on the conductive film was not studied and may affect the practical application of the process. The film is believed to be cupric sulphide.

[1]Cuba, Wis.
[2]Hayden, Ariz.

Consolidated Mercur

As explained in last year's report of the president of the Consolidated Mercur Gold Mines Co., operating at Mercur, Utah, operations then were on a precarious basis and a permanent shutdown seemed imminent. However, conditions in the mines improved for a time, and as a result the year ended June 30, 1912, showed an operating profit of $10,797. Of this, $8239, however, had to be written off as depreciation on stores and on stock held in the Manning Leasing Co. While developments during the present year have once or twice given some encouragement, conditions are substantially as they have been for some time. As the company has previously announced, it will continue to operate as long as it can pay expenses and then it will shut down and dismantle the plant, if it can be disposed of. The company has been looking for a new mine, but so far unsuccessfully. The plant and equipment would be, of course, much more valuable if it could be used at some new plant, rather than dismantled and sold as second-hand machinery. Dividend No. 27 of $30,000 was paid during the year, partly from accumulated surplus, and the balance of assets as of June 30, 1912, was $57,760. Dividends to date paid by this company amount to $1,235,000, while including the dividends paid by the old Mercur and De La Mar companies, before consolidation, the total is $3,415,313. During the year, 67,816 tons of base ore, 119,776 tons of oxidized ore and 14,060 tons of old tailings were treated, with an average recovery of $2.45 per ton. The loss in tailings was $0.82 per ton, giving a total average value of all material treated during the year of $3.27. Mining cost, $1.41 per ton of ore mined; treatment of tailings dump, $0.17 per ton of tailing; milling, $1.10 per ton of ore milled or a total of $2.42 per ton of ore treated.

Reclaiming Tin from Old Cans

The high price of tin has again stimulated the desire to reclaim the tin from old tin cans. It is well known that the tin on the cans is pure and the sheet iron or steel upon which it exists carries about 2% (*Brass World,* November, 1912). Therefore, from every 100 lb. of tin cans, 2 lb. of tin could be obtained.

The difficulty encountered in reclaiming the tin from such material is the amount of foreign matter on and in the old cans. Foods, dirt, labels and other foreign material are always present. Many of the cans are lacquered, too, which interferes unless removed. In order to remove the tin by any process it is first necessary to remove the foreign matter. This must be accomplished by the use of alkalies, such as potash or soda, and heating to burn off the organic matter cannot be employed for the reason that it leaves a coating of carbonaceous matter on the cans that is worse than the matter previous to heating.

It has been found that the cost of removing this foreign matter is so great that the profit is taken from the operation of reclaiming the tin. That is, it has been found so by a number of concerns who have attempted to carry out the process. Cans can be obtained and the tin can be removed from them if quite clean, but there is so much foreign material present in and on the cans that it is usually considered that "it does not pay."

Detinning companies work upon new tin scrap that is perfectly clean and the supply is obtained from concerns who make tin-plate goods, such as tin cans, and in some instances by whom they are controlled. It will readily be appreciated that with such a source of clean, tin-plate supply, the obtaining of tin is a different problem from reclaiming it from old tin cans.

To remove enamel from almost any metal, according to *Revue Produits Chimiques,* it is necessary only to heat the enameled object in a furnace or muffle to a red heat and cover the surface with powdered potassium cyanide. After cooling, the enamel will be soluble in water.

The Mining Index

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This index is a convenient reference to the current literature of mining and metallurgy published in all of the important periodicals of the world. We will furnish a copy of any article (if in print), in the original language, for the price quoted. Where no price is quoted, the cost is unknown. Inasmuch as the papers must be ordered from the publishers, there will be some delay for foreign papers. Remittance must be sent with order. Coupons are furnished at the following prices: 20c. each, six for $1, 33 for $5, and 100 for $15. When remittances are made in even dollars, we will return the excess over an order in coupons, if so requested.

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20,807—FUEL ANALYSIS—Dry Fusion with Alkalies and Subsequent Oxidation with Bromine. Irving C. Allen and T. W. Robertson. (Internat. Congress of Applied Chemistry, Sept., 1912; 7 pp.)

20,808—IRON—A Revision of the Atomic Weight of Iron. G. P. Baxter and C. R. Hoover. (Internat. Congress of Applied Chemistry, Sept., 1912; 16 pp., illus.)

20,809—MAGNESIA IN LIMESTONE—The Rapid Determination of Magnesia in Limestone by Means of the Hydrogen Electrode. Joel H. Hildegrand and Herbert S. Harned. (Eighth Internat. Congress of Applied Chemistry, Sept., 1912; 9 pp., illus.)

20,810 — MANGANESE — Determination of Manganese as Sulphate and by the Sodium Bismuthate Method. William Blum. (Journ. Am. Chem. Soc., Oct., 1912; 18½ pp.) 80c.

20,811—QUALITATIVE ANALYSIS—Cadmium Nitrate in Qualitative Analysis. Anton Vorisek. (Internat. Congress of Applied Chemistry, Sept., 1912; 12 pp.)

20,812—TANTALUM ELECTRODES—Tantalelektroden. O. Brunck. (Chem. Ztg., Oct. 19, 1912; 1 p.) On the use of tantalum electrodes instead of platinum in laboratories. 40c.

20,813—TEMPERATURE CONTROL—The Control of Temperature in the Operations of Analytical Chemistry. Theodore W. Richards. (Eighth International Congress of Applied Chemistry, Sept., 1912; 6½ pp.)

20,814—TEMPERATURE MEASUREMENT—The Measurement of Temperature in the Operations of Analytical Chemistry. Theodore W. Richards. (Eighth International Congress of Applied Chemistry, Sept., 1912; 9½ pp.)

INDUSTRIAL CHEMISTRY

20,815—ACIDS—Problems in the Manufacture of Chemically Pure Acids. J. T. Baker. (Met. and Chem. Eng., Nov., 1912; 4½ pp., illus.) 40c.

20,816—ATMOSPHERIC NITROGEN—Fixation of Nitrogen by Alumina and Carbon. S. A. Tucker and Henry L. Reed. (Met. and Chem. Eng., Nov., 1912; 1½ pp., illus.) Paper before Am. Electrochem. Soc., Sept., 1912. 40c.

PERSONALS

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

There is a vacancy in a junior position on the editorial staff of the JOURNAL. Applicants are requested to call in person.

James McNaughton, general manager of the Calumet & Hecla mines, is visiting New York.

N. H. Emmons has been appointed superintendent of the mines of the North Butte Mining Co., at Butte, Mont.

Thomas F. Cole has been elected president of the North Butte Mining Co., in place of Capt. James Hoatson, who has resigned.

L. B. Pressler has been appointed superintendent of the mines of the Ozark Mining & Smelting Co., at Magdalena, New Mexico.

S. H. Treloar has resigned the management of the Utah Metal Mining Co., of Bingham, Utah, and will engage in personal mining business.

A. F. Flynt has returned to the Zopilote and Purisima mines, in the Territory of Tepic, Mexico, after an extended absence in the United States.

Archibald Johnston, vice-president of the Bethlehem Steel Corporation, has returned from a business trip to Chile and other South American countries.

Robert Linton, who has recently been in Summit County, Colo., on professional work, is now engaged in examining some iron-ore properties in east Texas.

J. B. Tyrrell, of Toronto, Ont., left for a short visit to England, on Nov. 30. His address while there will be 224 Salisbury House, London, E. C., England.

Frederick D. Smith, recently manager of the Seven Devils Copper Co., at Landore, Idaho, has been appointed manager of the Snow Creek mine, at Greenhorn, Oregon.

William F. Carroll has resigned his position with the Compañia Metalurgica Mexicana, at San Luis Potosi, to accept a position with the Blaisdell Coscotitlan Syndicate, at Pachuca, Hidalgo, Mexico.

Howland Bancroft has been in Washington and Philadelphia and is now in New York for a week or 10 days, after which he will go to Boston. He expects to return to Denver about the holidays.

James M. McClave has been appointed consulting engineer for the Sutton, Steele & Steele Manufacturing, Milling & Mining Co. This company is now building a testing plant at Denver, to handle Western business.

Louis W. Groat, a mining engineer and promoter, of New York, has been declared insane by a jury, and has been committed to the Bloomingdale Asylum, at White Plains, N. Y. He was interested in Mexican and British Columbia mines.

B. Magnus, manager of the works of the Electrolytic Refining & Smelting Co., at Port Kembla, New South Wales, has been appointed general manager of the Mount Morgan Gold Mining Co., in Queensland. Mr. Magnus, says the *Australian Mining Standard,* though still a young man, has had a wide experience in the construction of similar works in the United States before coming to Australia under engagement to erect those of the Electrolytic Refining & Smelting Co. Prior to 1907, it had been the custom of the Mount Morgan company to ship its blister copper to the United States for treatment, but in that year it was decided to erect an electrolytic refinery in Australia, the result being the formation of the company, which has since been in operation in Port Kembla. Since then the Mount Morgan copper has gone through Mr. Magnus' hands at Port Kembla, and the work he has done there has given such complete satisfaction that it is not in the least surprising that he has been given full charge of the parent works at Mount Morgan. It is declared that it would have been impossible to have found a man who would give more entire satisfaction.

OBITUARY

William C. Litton died at Butte, Mont., Nov. 20. He was born in Missouri and went to Montana when a young man and engaged in mining work. For a number of years past he had been foreman at the Parrot mine, in Butte.

John Percival Jones died at Los Angeles, Calif., Nov. 27, aged 83 years. He was born in Herefordshire, England, in 1829, and came with his parents to the United States in infancy. He was educated at the public schools of Cleveland, Ohio. He went to California in the early days of the gold excitement, and was always proud of the fact that he was a "forty-niner." He engaged in mining with varying success, in California, and later in Nevada, where he was interested in mines on the Comstock Lode and elsewhere. In Nevada he was prominent in politics and in 1873 he was elected United States senator from that state. He was four times reëlected, holding his seat in the Senate for 30 years continuously. He became prominent in the Senate during the years of the silver excitement, and was one of the leading advocates of the free coinage of silver. On that issue he left the Republican party, to which he had been attached, in 1896. Later he returned to that party, explaining his course by saying that, while still a believer in bimetallism, the conditions had changed and the silver issue was dead. He was a delegate to the Brussels monetary conference during President Harrson's administration, and before that body he spoke for three days, the printed report of his speech containing more than 200,000 words. In 1903 he retired from the Senate and shortly afterward removed to California, where he had since lived, at Los Angeles, or at Santa Monica. Senator Jones saw many vicissitudes during his mining career and it was said of hm that he had made five fortunes and lost four of them, retaining the last.

Societies and Technical Schools

Rocky Mountain Club of New York—This club has moved to new and more spacious quarters, at No. 55 West Forty-fourth St., New York.

University of Pittsburgh—The students of the School of Mines have organized a mining society for the purpose of mutual assistance and discussion. Weekly meetings will be held, at each of which a paper on some mining topic will be read and discussed.

National Association of Cement Users—The ninth annual convention will be held in Pittsburgh, Dec. 10-14, inclusive; the sessions and headquarters of the convention will be held at the Fort Pitt Hotel. A large number of papers will be presented on the uses and applications of cement construction and on the manufacture and testing of cement and concrete. The meeting will be closed by a visit to the United States Government testing laboratories. The U. S. Bureau of Standards will afford the members an opportunity for inspecting the various methods in use for testing structural materials, especially cement and concrete. A reinforced-concrete column 30 in. in diameter and 16 ft. long will be tested to destruction in the recently completed ten-million-pound compression testing machine. The United States Bureau of Mines will give demonstrations in testing of fuels, explosives, mine-rescue work and other interesting matters.

Utah Society of Engineers—The regular monthly meeting was held on the evening of Nov. 15. A number of papers on hydro-electric plants and the undeveloped water power in Utah were presented. Prior to the reading of the papers a short business meeting was held, at which five new and six associate members were elected. The subjects treated were as follows: "Hydro-Electric Power Resources Tributary to Salt Lake City," by H. D. Randall, of the General Electric Co.; "Factors Determining Cost of Hydro-Electric Service," by Markham Cheever, of the Telluride Power Co.; "Continuity of Hydro-Electric Power Service," by Leonard Wilson, consulting engineer; "An Example of Modern Steam Relay Station," by C. A. Cohn, of the Utah Light & Railway Co.; and "An Example of Modern Transmission Practice," by L. J. Riter, of the Utah Light & Railway Co. The meeting was well attended, there having been 84 present.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

Nov. 27—A petition for temporary injunction has been filed in the superior court of Sacramento County to restrain the principal mines in Amador County from dumping mill tailings into the streams tributary to Dry Creek. The petitioners are Hugo and Martha Loss, owners of 160 acres of land on Dry Creek in the southern part of Sacramento County. The order, if granted, will be sought to be made permanent should sufficient evidence be adduced as to the destruction of the land as alleged. The mines affected by this suit are, in the order to their geographical situation from south to north, Zeila, Argonaut, Kennedy, Oneida, South Eureka, Central Eureka, Lincoln Consolidated, Little Amador, Bunker Hill and Fremont. These mines are on the central belt of the Mother Lode, extending from Jackson to Drytown. They are the most important operating mines on the Mother Lode. The temporary suspension of operation would be costly and disastrous. The permanent closing of the mines would wholly destroy the mining industry in Amador County, so far as present production is concerned, and seriously cripple the developing mines, which are largely dependent on the producing mines for continued development. There is no doubt that the permanent closing of the Mother Lode mines in Amador County would directly affect the mining industry in every district of the Mother Lode region in three other counties, Eldorado, Calaveras and Tuolumne, and extend into Mariposa. It is not improbable that such result would seriously affect the development of mining properties in other parts of California. The last season has been active in the reopening of old mines and the development of new claims in the Mother Lode region, and the outlook for future increased production and permanent operation has not been equaled is a number of years. There has been a good deal of complaint by the farmers on Dry Creek and tributary streams, and the mining companies have paid large sums for damages and endeavored in every way to prevent damage to the lands. The South Eureka and adjoining properties have completed and will have in operation in the beginning of December a ditch and flume construction designed for the special purpose of preventing the overflow of the waters of Dry Creek and its tributaries; but the preparation for this equipment seems not to have satisfied the plaintiffs in the action just undertaken in the superior court. The 160 acres of land which it is alleged to have destroyed by an overflow, is said to be an improved farm. Should the plaintiffs secure even a temporary injunction, other suits will be filed. It it probable, however, that the defendant mining companies will be able to show that the ditch and flume equipment, when in full operation, will be sufficient guarantee against further damage to the lands affected. Unless the mine owners may be protected against the threatened closing of the mines, the equipment for preventing overflow will not be continued in operation. In that case there is reason to expect that the farmers affected by the operation of the Mother Lode mines in Amador County will be in the same position that the farmers affected by the hydraulic mines were placed when hydraulic mining was curtailed by legislative action. The streams still overflow in the flood season, and will continue to overflow until safe and practical engineering plans shall be adopted, whether the mines are in operation or closed permanently.

Denver

Nov. 29—According to the official report just issued the Camp Bird mine at Ouray cannot continue producing much longer unless the work being done uncovers some unexpected ore. General Manager W. J. Cox says in an appendix to his report for the fiscal period ending June 30, 1912 that no ore of importance was disclosed, other than that developed within the area covered by the known oreshoots. The most important shoot of ore is in the stope, between the third level east and the fourth level east No. 2, and which will later be reached from the fifth level east No. 2, to be established 100 ft. deeper. He further states that in no other part of the mine does development work offer any encouragement to further advance the various headings and all work of this nature is confined to the territory tributary to shaft No. 3. The probability of early exhaustion of the Camp Bird has been recognized by the directors for several years, and they have accordingly cast about for other promising properties to develop with the result that the company is now interested in the Messina copper mine in the Transvaal, the Santa Gertrudis silver mine in the Pachuca district in Mexico, and it is now stated that negotiations have been opened for the acquisition of the Campo Morado mine in the state of Guerrero, Mexico.

The Montana mine purchased by the Tomboy company, of Colorado and London from the Revenue company of Ouray appears to have done well during the fiscal year ended June 30, 1912, as it supplied 21,702 tons of ore to the mill of an average grade of $10.50 and according to Manager Herron, the reserve of ore has been increased rather than decreased, since the purchase of the mine in 1911. The Tomboy company owning also the Argentine & Cincinnati made a working profit of $450,941 during the year.

Butte

Nov. 27—A windstorm, the most violent in many years, passed over the city of Great Falls and vicinity on the morning of Nov. 22 and inflicted such damage on the electric power lines that the Butte mines of the Anaconda company, and the concentrator of the Washoe smeltery at Anaconda were forced to suspend operations for several hours. During this time only one power line into Butte was in commission, that from the Big Hole River power plant. Many of the power line towers of the Great Falls plants were destroyed, but by at once placing a large number of men to repairing the damage, only one shift was lost in the Butte mines.

Thomas F. Cole, of Duluth, who was recently elected president of the North Butte Mining Co. stopped at Butte for a few hours Nov. 25, on his way from Utah to Duluth. Mr. Cole is interested in the Rainbow Lode Development Co., recently organized to operate a group of claims situated east of the Butte & Superior holdings. He made arrangements while in Butte to begin the work of sinking the shaft on one of the claims, the Third Sphinx, from which the group will be developed.

Salt Lake City

Nov. 28—The Utah Copper Co. declared its fourth quarterly dividend for the year Nov. 25, amounting to $1,182,412. The last dividend of 75c. per share was paid in October. Including the present dividend, the aggregate paid by this company amounts to $16,428,722. During September, 6,965,144 lb. copper was produced. The October production was 2,128,792 lb., the reduced output in these

two months being due to the strike. During the first 10 months of the year, 85,396,607 lb. copper was produced.

If the Moffat road is completed from Colorado into Utah, as at present seems likely, undeveloped portions of the state, which are being held back by lack of railroad transportation, will be opened up. The Uinta Basin district in Wasatch County, in particular, will be benefited. This basin contains large deposits of hydro-carbons, mineral wax, rubber, and gilsonite, beside crude sand- or rock-asphalt. The gilsonite occurs in veins three feet and more in width, and has been opened to a depth of several hundred feet. On the cars at Price it is worth about $33 per ton. Mining cost ranges from $2 to $2.50 per ton. The known quantities of gilsonite at present developed are estimated to be worth about $7,000,000.

Cobalt

Nov. 30—By still further reducing the royalties, the provincial government has taken an important step affecting some of the Cobalt mines. The announcement has been made that arrangements are concluded between the directors of the Chambers-Ferland and the government, whereby the royalty has been canceled. It is provided, however, that in case any rich or valuable bodies of ore are discovered, and the company is able to make such net profit from its operations as will enable it to pay a dividend in excess of 10%, then after making allowance for the payment of this dividend, the government may require the company to pay a royalty not exceeding the royalty payable under the previous agreement. It is also understood that the government is considering the removal of the royalty on the Hargraves mine on the same conditions as those granted the Chambers-Ferland, and alterations are also to be made in the case of the O'Brien. In this last property, the royalty will be 15% instead of 25%. The Chambers-Ferland mine has been paying a royalty of 25% of its net profits to the government, but during the last year, the operations at the mine have not been more than sufficient to cover the operating expenses. The Hargraves and O'Brien are believed to be in a similar position to Chambers-Ferland. Action by the government is expected in these cases also. There are several other mines in Cobalt paying royalties, but it is not likely that they will be affected by the reduction. During 1911, the following mines paid royalties: O'Brien, $61,695; Hudson Bay, $57,962; Chambers-Ferland, $10,000, and Hargraves, $1200. Last year, the government collected a total of $246,529 in royalties, exclusive of those paid to the railway commission, while the total royalties paid to the government up to the end of last year amounted to $1,000,000.

Porcupine

Nov. 30—Little change has taken place place in the strike situation during the last week. The most noticeable improvement has been at the Hollinger, where a large number of the old employees went back to work. Men for the different mines are being recruited at various places and are being sent in on special trains, and on account of the large number of strikers who have left the camp, it will be necessary to recruit a heavy force. There has been some talk and considerable uneasiness over the probability of the Cobalt miners going on strike and still further complicating the situation. These fears, however, were proved to be groundless. When the matter was voted on the men decided not to go out by a vote of 10 to 1. At the Hollinger, over 18 machines are working and at the Dome, development has again been started in some of the workings.

Chihuahua

Nov. 22—During the last three weeks several productive mines in various parts of the state have perfected plans for the resumption of work immediately that security in the safe conduct of operations is assured. A number of important property transfers are also in abeyance for the same reason.

On Nov. 20, a band of 200 so called rebels visited the camp of Santa Eulalia, 15 miles from the city of Chihuahua, and robbed the merchants of several thousand dollars' worth of merchandise and some money, and caused the San Toy Mining Co. to pay several thousand dollars as ransom for A. N. Fink, the superintendent. After spending about 36 hr. in the town and about the mines, the band withdrew before the arrival of federal troops. Some of the engines and rolling stock of the Chihuahua-Potosi Mining Co.'s narrow-gage railroad were badly damaged, as was the track in several places. Now everything is quiet again and work is going on uninterruptedly, although there is some fear of a rebel revisitation. The Rio Tinto, Concheño and other camps lately looted have not been revisited, presumably on account of the stationing of federal or other troops at the properties with strict instructions to shoot to kill.

It was anticipated that service over the National Rys. line between Chihuahua and El Paso would be reëstablished during the month, but this was prevented on account of the activities of the rebel bands in the northern part of the state. Several lately rebuilt bridges and trestles were reported destroyed a few days since and the telegraph lines have been out of commission most of the time. The progress of repairing the Mexico Northwestern Ry. from Madera north continues slow on account of the activity of small looting bands. The line between Chihuahua and Madera was also lately troubled by rebels and only irregular service is maintained. The National line south has not been lately interrupted, although marauding bands infest the settlements between Jimenez and Torreon. The Parral and Durango branches of the National are operative.

During the early days of the month it was feared that there might be trouble at Mapimi, Durango, on account of the disloyalty of the volunteers, but this possibility was immediately removed, by sending federal regulars to arrest and replace the Zapatista converts.

The Guanacevi camp was lately visited by rebels who looted the stores and forced the few working mines to temporarily suspend. In the mountain camps and particularly in places removed from railroads, there seems to be a concerted action on the part of robbing bands to respect no one and least of all Americans—from whom it may be possible to secure supplies and money either forcibly or otherwise.

The Chihuahua, Terrazas, Torreon, Asarco and Aguascalientes smelteries continue uninterrupted operations at almost normal capacity. The Chihuahua smeltery in particular has been fortunate in at no time during this year's troubles being obliged to suspend, and just now is operating at larger tonnage than ever.

The Calera Mining Co. is contemplating the renewal of shipping operations and may shortly adopt a new method for more economically handling the complex lead-zinc sulphides. The Cia. Minera de Oro Tres Hermanos in the Batopilas camp is conducting ore tests with a view of building a cyanide plant. It is reported that Paul Ginther and Canadian associates are to build a 200-ton cyanide plant in the Parral camp. They have acquired many properties in that camp during the last two years. The Arizona-Parral Mining Co. is planning on the early reworking of its El Tajo mine at Parral. The Siglo XX and Cerro de la Campaña mines at Naica are under development by Paul Ginther and associates. The activities in the Cusihuiriachic camp continue unabated. The following mines are regular producers: Promontorio, Princesa, San Juan, Durano, Escuadro, Cusi-Mexicana and Reina, while the Gran Potencia, Veta Grande, Chuza and a half dozen others are being actively developed. Several property transfers have lately been recorded and several others are pending.

New York men are making examinations of copper properties along the Orient Ry., east of Chihuahua. Some of these properties have a production record and others are even now small producers. An important gold-ore streak is reported at a depth of about 600 ft. in the Julietta mine, near Jimenez.

The Mining News

The Current History of Mining

Alaska

Cripple City, on Cripple Creek, the new town in the Innoko district, continues to grow. Many Iditarod men and some from Ruby are making their headquarters at Cripple City and will prospect the surrounding country this winter. To date the best discoveries so far made in the new camp are on Fox Creek, where gold was first found, although Cripple Creek also has some good showings.

Supplies are being furnished by the merchants of Fairbanks to the miners of Birch Creek and others of the Circle district who have volunteered to cut a trail from Twenty-Mile Creek, on the present Circle trail, up Birch Creek and over the divide to the Big Chena, thence down to Hot Springs, thus connecting the two routes and shortening the distance from Birch Creek to Fairbanks by 20 miles. An application has also been made for a post office at Chena Springs, and it is hoped that the post-office department will route the Circle City, Eagle and Dawson mails over the Chena road rather than the one now used.

Newsboy—The five-stamp mill for this property has been permanently installed on 11 above on Cleary Creek, and is crushing ore.

Rexall—Horton & Solomon, owners of this group, near Fairbanks, are building a two-stamp mill, and planning other developments.

Kenai-Alaska—The stamp mill at this mine, near Seward, has been closed for the season on account of the breaking of the traction cable of the aërial tramway, and from now on a crew of workmen will be doing development work until spring, when the cable will be replaced and work resumed.

Alaska Treadwell—During October, 77,924 tons of ore milled yielded $191,554 in gold and concentrate or $2.48 per ton at an estimated net profit of $101,050.

Arizona

Maricopa County

Lars Anderson has opened up a quantity of high-grade copper ore on his claims 14 miles west of Arlington; 40 or 50 claims have been located in this vicinity since the discovery of high-grade ore on the claims which belong to Mr. Anderson.

Red Rover—This mine north of Phœnix continues to ship high-grade silver and copper ore. A number of teams are hauling the ore from the mine to the railroad. Active development work has been started.

Max-Delta Mining Co.—At this property south of Phœnix, driving is in progress and sinking will not be resumed until a pump is installed. The shaft at present is 165 ft. in depth. W. S. Jennings, of Phœnix, is superintendent.

Kay Copper Co.—Shipments of ore have been discontinued pending the sinking of the shaft to a lower level. Ore has been encountered on the 300-ft. level and the drift has been driven for 20 or 30 ft. and good ore has been found.

Santa Cruz County

Rainbow—A. B. Richmond, of Tucson, formerly manager of the Mansfield Mining & Smelting Co., has offered to take over on bond this group of claims near Alto, owned by Michalski, Habenicht & Reichert. The ore contains copper and silver, and there are several veins on the claims.

California

Amador County

Keystone—An empty skip that had been lowered from the dumping chute in the headframe, but not securely held by the brake clutch, got away and descended to within about 30 ft. of the bottom of the shaft. The hoist is operated by steam. The engineer thinking the skip secured had gone to attend a boiler. He applied the brake gradually and lessened the speed of the runaway skip, which kept the track until within a few feet of the place at which it was stopped. Some damage was done to timbers, but the men working on the 1500-ft. level, warned by the noise, reached a place of safety in time to escape injury had the skip gone to the bottom.

Butte County

Gold Bank—Recent development has disclosed high-grade milling ore and about 500 tons has been blocked out. This ore is said to be detached from the main vein. This appears to corroborate the opinion that has been expressed by engineers that the orebodies in the Gold Bank are lenticular rather than in the form of detached veins. M. J. Cooney, of Forbestown, is manager.

Brown Bear Mining Co.—This is a new incorporation with $250,000 capital stock formed to operate in Butte County. The incorporators are C. B. Whitmoyer, Marvin Gary, J. W. Charge, James N. Crabb, of Chico and L. A. Snow, of Lovelock.

Calaveras County

Utica—Work is to be resumed after a temporary suspension, which was due in part to the fear that there might be a shortage of water. The recent snow in the higher elevations and rains in the foothill sections have dispelled anxiety regarding water supply. F. J. Martin, of Angels, is superintendent.

If-I-Can—This mine which was recently reopened by the Stanislaus Gravel & Development Co. has been closed down despite recent reports that the directors and other stockholders residing at Portersville in Tulare County had announced that sufficient capital was in hand for extensive development and operation.

Wagerman—A five-inch bore is being put down on the north end of this mine near Angels. The first test hole was sunk 400 ft. but was abandoned on account of caving. H. W. Kuns is manager.

Eldorado County

China Hill—A vein six feet wide has been cut in the tunnel about 200 ft. in from the portal and about 140 ft. below the surface. The mine is in the Placerville district, four miles southwest of El Dorado. China Hill Mining Co. is owner; W. H. Noy, of Alameda, president.

Landecker—The old deep blue channel has been cut in the 700-ft. bedrock tunnel about 2500 ft. east of the old workings. The gravel is in a blue formation and cemented. It is reported that the owners contemplate the installation of a gravel mill. Ideal Mining Co. is owner; S. O. Ames, of Los Angeles, president.

Queen Elizabeth—Sinking has been resumed at this mine, formerly the Nonpareil, near Virner. The shaft will be sunk to 60 ft. and a drift driven to tap the gravel. E. H. Callahan is superintendent.

Inyo County

Skidoo Mines Co.—During October 1152 tons of ore mined and milled yielded $15,551 in gold at a total cost of $5034.

Kern County

Yellow Aster—A new 500-ton ore bin is under construction at the southwest end of the glory hole. Twenty-five miners were added to the crew in November,

making a total of 225 men now employed.

King Solomon—Twenty tons of ore are on the dump at the Wickard-Drennen lease, extracted from the 85-ft. level. Driving to the northwest is in progress. The same vein of high-grade ore found in the Teagle-Lamberson lease has been disclosed in this drift.

Consolidated Mines Co.—A 52-ft. drift has been driven west from the shaft in the Good Hope on the 230-ft. level, disclosing the same quality of ore as found in the east drift. A crosscut is being driven from the main shaft north to the west drift to facilitate handling ore. Driving has been started in the 300-ft. level. Twenty-five tons of ore are on the dump. Twenty-two men are employed on the Good Hope. The Twin Brothers shaft has reached the 65-ft. level, and several tons of ore have been extracted.

Madera County

Madera Consolidated—The stamp mill is being repaired, a new concrete collar is being built at the shaft, and unwatering the mine will be undertaken immediately. J. H. Lester, of Grubgulch, is superintendent.

Enterprise—Machinery for a new stamp mill is being delivered at this mine, near Ahwahnee. The mine was formerly a large producer. Lewis Johnson is manager.

Nevada County

Prudential—The mine is operated under lease. Six stamps are dropping on good ore extracted from the 900-ft. level. A. P. Wilson, of Grass Valley, is superintendent.

Placer County

Eldorado & Placer Gold Dredging Co.—The ground at Poverty bar is being prospected with Keystone drills. A maximum depth of 41 ft. has been drilled. The prospect shows much fine gold. The company is preparing to build a bucket elevator dredge. Alfred Tregidgo, of San Francisco, is manager.

Sacramento County

Natomas Consolidated—The pit is dug for the laying of the hull of the new steel dredge to take the place of No. 7, a wooden dredge that has gone out of commission. The new boat will be all steel and will be equipped with 9-cu.ft. buckets to dig 58 ft. below water line. It is expected to complete the construction early in 1913. Paul E. Morse is general superintendent of construction for the Yuba Construction Co., the builder.

Trinity County

Headlight—The mine has closed down for the winter season. The milling plant will probably be remodeled in the spring, owing to a change in the ore.

Colorado

San Juan District

The Smuggler company has 300 men on its payroll, including those at Blue Lake, the Bridal Veil Falls generating station, its mills and mines. An electric motor is being installed at Blue Lake in case water gets low during the winter, when the motor and pumps will raise the water to the pipe line used for generating power at the Bridal Veil station. The Liberty Bell is keeping its mill supplied with 500 tons of ore daily and paying dividends regularly. Work on the Tomboy terminals is going ahead, and it is expected that the tramway will be in operation by the first of the year. Fifteen men will be kept at work all winter on the Bear Creek mill of the Junta Consolidated Gold Mining & Milling Co., which will be finished next spring.

Although most of the high mines are closed in by snow, they are being worked, and when spring and summer comes there will be a big pile of ore ready for shipment. The chief producers will be Sunnyside, Iowa-Tiger, Gold King, Bagley Tunnel and Silver Lake, each employing from 10 to 20 men. Charles Gagner, manager of the Bagley Tunnel, has just finished this new mill and is ready to start the machinery. The Barstow mill, in the Red Mountain district (Ouray County), has closed down, owing to shortness of water, but the mine will be worked all winter under Manager Wilfley. The Highland Mary, near Howardsville, is being worked under the management of D. McLean and is producing rich ore.

Tomboy—During October, $86,000 in bullion and concentrates was recovered from 11,000 tons of ore, the net profit being $28,248.

Teller County—Cripple Creek

The flow from the portal of the deep drainage tunnel is 9060 gal. per min. and the general recession in the deep shafts of the district is from three to five inches per day. Total recession in the Elkton shaft is 220 ft., in the Mary McKinney 217 ft.; the El Paso shaft at 1100 ft. is making 500 gal. per minute.

El Paso—The holdings of James F. Burns, amounting to 83,000 shares, have been bought by President Allen F. Burris, Vice-President Charles M. Heberton and others owning the control of the mine. The stock was bought for the European interests, which last summer began to acquire control of El Paso.

Doctor Jack Pot—The deep drainage tunnel has enabled this company to sink its main shaft another hundred feet, giving it the ninth level and 300 ft. of stoping ground on the several producing veins. Net profits for the first nine months of 1912 are $5850. This would have been larger but for the apex suit being carried on by this company against the Work Mining & Milling Co., which is now in the U. S. Supreme Court. Ten sets of lessees are working and cash in treasury including ore in transit is $23,395.

Idaho

Bonner County

Idaho Continental—The road work has progressed as far as the river at Port Hill and will be completed within a few days. Machinery for the new mill has begun to arrive.

Boise County

Banner—Work has been suspended for the winter.

Idaho City—Both dredges continue to run profitably.

National Development Co.—A successful run has been made in the new mill and the company is considering the installation of a larger plant next spring.

Boston-Idaho Co.—This company recently acquired the Gold Hill & Iowa Mines Co. and has bonded adjoining property. About 30 men are employed in doing development work. The Gold Hill vein has been found on the 500 level and work is progressing in both directions. E. E. Carter is manager.

Coeur d'Alene District

Green Hill-Cleveland Mining Co.—A reader corrects the statement made in these columns in the Journal of Oct. 26, 1912, in which it was said that the Green Hill claim holds a continuation of the Mammoth vein. The Green Hill claim is northwest of the Mammoth and the vein all the way through the Standard and Mammoth claims runs a little south of west on a general easterly and westerly strike.

Idaho County

Jumbo—Operations are being concentrated on the No. 4 level on which a large shoot of milling ore is opened. Five more stamps are being put into commission.

Nez Perce County

Having secured a favorable decision from the land office in the contest filed against 140 acres of Quartz Creek placer ground, W. J. Harris, of Spokane, plans to install a $50,000 dredge and operate on an extensive scale.

Shoshone County

Burlington—A second shift has been put to work in the crosscut, which will be driven 80 ft. further to cut the vein.

Empire Milling & Developing Co.—This company has acquired the King, and Wonder groups on Pine Creek. Ore is being shipped from the King.

Yankee Boy—The first shipment of ore from the lower level has been made by Sidney Shonts, lessee.

Carey Copper Co.—A shoot of galena has been found in the lower tunnel.

Michigan

Copper

Ahmeek—This company is trying mules underground as an experiment in underground haulage.

Old Colony—No. 18 drill hole has been completed at a depth of about 1725 ft., having reached the basal conglomerate. At the place where the Mayflower lode was intercepted the formation was badly broken and the core showed but a small amount of it. This outfit will be moved to the site of No. 20 hole, which will be about 900 ft. to the east of the No. 18.

Hancock—This company's shaft is bottomed at a depth of 4000 ft. and attention is being given to openings preparatory to putting the property on a producing basis. Crosscuts will be run from the 29th, 33d, 36th and 39th levels, and at the bottom a large station will be cut and equipped with an electrical hoisting equipment to work the Pewabic lode at a greater depth. During the opening of the shaft three other formations were revealed, besides the objective Pewabic lode, and each gives promise of becoming profitable. From the Nos. 2 and 3 lodes a large tonnage was sent to the Allouez-Centennial mill, which yielded an average of 18¼ lb. copper per ton. The No. 4 lode, which was cut by the shaft at a depth of about 3100 ft., was about 19 ft. wide and well mineralized. Arrangements have been made so that all future expenditures will be taken care of without the necessity of calling an assessment, so that the company will not be handicapped by lack of funds and the work can go forward without interruption and the property be put on a producing basis. Arrangements have been made to use one of the heads of the Lake Milling, Smelting & Refining Co.'s mill.

Iron

American—Shipments continue to the Canadian Soo, where the American ore is mixed with Canadian ores at the furnaces. The route is by the Duluth, South Shore & Atlantic Ry.

Empire—This mine, of Oglebay, Norton & Co., has been closed for the season. About 35,000 tons were shipped. The mine will be kept pumped out during the winter.

Richmond—This mine, of M. A. Hanna & Co., will be equipped with a new crushing plant, so that by using two gyratory crushers of different size, the ore will be crushed finer.

Peninsula Power Co.—This Menominee Range power company is either supplying electrical power or will, in the near future, to the following mines in the Iron River District: Davidson, Wickwire, Cortland, Bengal and Bates. At Commonwealth, Wis., it will supply power to the Ernst mine, of the Florence Iron Co. The policy of using electrical power for mine air compressors has made possible the sale of several electrically driven compressors; most of these have been sold by the Ingersoll-Rand Co.

Chapin—At this big mine of the Steel Corporation, at Iron Mountain, much trouble has been experienced by excessive flows of water underground, making it necessary to build stone and concrete bulkheads in some drifts. Recently a "vug" was tapped on the 16th level of the Hamilton shaft, and the 15th and 16th levels began to flood. All the men were ordered to surface for 36 hours until the danger had abated.

Oliver Iron Mining Co.—The diamond-drill exploration, west of Republic, on the lands of the Michigan Iron & Land Co., is steadily working westward around Fence Lake and Net Lake. Net Lake is several miles north of Amasa, and the drilling apparatus was shipped by that route.

Imperial—The pumps have been started to unwater this mine at Michigamme. The new steel headframe is partially erected. The change-house has been enlarged to accommodate 200 men. The shaft will be repaired and the coal dock will be lengthened. Everything will probably be in readiness to start mining by January.

Spring Valley Iron Co.—Men of this company, operating the Zimmerman mine at Palatka, have taken an option on 80 acres of the McKenna lands on the Menominee range just east of the village of Quinnesec. Diamond drilling will be started soon. The Quinnesec mine of Corrigan, McKinney & Co., about ½ mile to the east, has shipped 625,000 tons of ore since 1878, most of which was low grade. The McKenna land is in Sec. 2, 39-30. A company will be formed to explore the property.

Missouri

Joplin District

Much work is being done on both sides of Ben's Branch, between Webb City and Carterville. Most of the land is owned by the Center Creek Mining Co. and has been mined to a large extent. At present the work being done is in the nature of prospecting, small steam and horse hoists being used. Ore is being hoisted from 12 shafts and is cleaned on hand jigs or is sent to custom mills. Little equipment or capital is required and small deposits are worked out that a large company could not handle economically.

Minor Heir-Sunrise—Articles of incorporation have just been filed for this company capitalized for $20,000 in $1 shares. The company is operating the Sunrise mine near Spring City.

Granby—Shaft sinking has been started on Sec. 36, Newton County. The land has just been prospected with churn drills and ore was encountered from 135 to 170 ft. The land is in virgin territory. Two drill rigs are yet in operation.

Mercantile Metal Milling Co.—This company, one of the largest operating in the district, has purchased a 140-acre tract of mineral land west of Sarcoxie for $15,000. The Reo Mining Co., of Carthage, has a lease on 20 acres of the tract and is now erecting a 125-ton mill.

Osceola—This mill, in the north Webb City sheet-ground district, is to be opened by the Mercantile people. The old plant is to be overhauled and the capacity increased.

Chicago-Lehigh—This company's new mill, on the Knight land at Carl Junction, is now in operation. About four

B. L. Van Hoose—This mine recently made its initial shipment. However, it will be some time before the plant will be running full capacity as the mill was erected before any drifts were opened.

Vantage—This mill has been started by the Minor Heir-Vantage Mining Co. on the old Silver-Dick ground, north of Webb City. The operators are cleaning up the ground preparatory to working it with a steam shovel.

Montana

Butte District

North Butte—President T. F. Cole, during his recent stay in Butte, made an inspection of the Speculator mine. Some excellent orebodies have been opened on the lower levels in the last few months. The Gem vein, which was recently opened on the 2800-ft. level, disclosed a body of 5% copper ore. On the 2600-ft. level the Adirondack vein was cut a short time ago, the ore averaging about 10% copper for a width of four feet. The veins are steadily increasing in width and value as depth is attained below the comparatively barren zone between the 1800- and 2200-ft. levels.

Butte-Duluth Mining Co.—Capt. A. B. Wolvin, president of the Butte & Superior Mining Co., who recently bonded the Brundy group of claims adjoining the Bullwhacker mine on the southeast, has begun active development work on the property. The Butte-Duluth company has been organized to operate the group, which consists of the Macarona, Montgomery, and portions of the Altoona, Colleen Bawn and Amazon claims. On the Montgomery the old shaft has been cleaned out and retimbered to the 80-ft. level. An electrically operated, single-drum, Nordberg 75-hp. hoist, having a capacity for sinking to a depth of 1000 ft., has been installed, as well as a Nordberg air compressor capable of compressing 750 cu.ft. of air per min. As soon as the 100-ft. level is reached a crosscut will be driven east to the center of the

vein, which is a continuation of the Bullwhacker, and the ore will be mined through glory-holes as in the Bullwhacker. A large dump has been sampled and found to assay between 1 and 2% copper, which the company is planning to recover by leaching by a process similar in many respects to that shortly to be put in use at the Bullwhacker mine. On the Macarona claim to the east a second fault fissure, paralleling the Bullwhacker-Montgomery enrichment zone, and apparently of the same fault series, has been traced for a distance of several hundred feet across portions of the Macarona, Altoona and Amazon claims by numerous open cuts and tunnels. The ore is of the same general nature as that found in the Montgomery, consisting of impregnations of the crushed and decomposed granite zone. The surface consists of the fractured rock coated with copper in the form of chrysacolla, cuprite and carbonates, assaying from 2 to 5% copper. No definite width of the enriched area has been established, but in many places the overburden has been stripped, exposing a large tonnage of the low-grade material. Excavation is well underway on the Macarona claim for the new leaching plant, which the management hopes to be ready within two or three months.

Deer Lodge County

Southern Cross—About 50 men are now employed at this property of the Anaconda company in the Georgetown district, and it is believed that ore shipments over the newly completed railroad from Anaconda to the mine, will begin some time next February. The work of retimbering and changing the shaft from two to three comparments, has been nearly finished, and soon the work of sinking an additional 200 ft. will be started. A new engine house will be completed in a short time, and an electrically operated hoist will then be installed. Much of the new equipment has arrived, and preparations are being made to build ore bins and a transformer building. A large amount of development work has been done in the mine in the last few months and considerable ore has been blocked out in addition to the reserve of low-grade ore which had been opened previous to the time that the Anaconda company took over the property.

Madison County

Blowout—This property, in the Rochester district, recently acquired by the Corbin Copper Co., is rapidly being prepared for mining operations. The old shaft has been cleaned out to the 100-ft. level, and the work of sinking an additional 200 ft. is progressing. At the 300-ft. level, crosscutting to the veins will be started. R. M. Edwards, president of the company, recently made an inspection of the mine.

Nevada

Clark County

Yellow Pine—The September report shows a net profit of $28,000 more during the month. The fifth dividend for the year, totaling $19,000, was declared Nov. 25, which brings the total dividends for the year above $100,000. Ore reserve for at least one year is blocked out, and recent development work has encountered new orebodies, which as yet have not been explored. A Temple-Ingersoll drill has been purchased by the company for use in development work; 70 men are at work.

Columbia—The new gasoline hoist has arrived and is being installed. Considerable copper carbonate has been encountered in the old shaft, and shipments are to commence at once, one car being now ready. B. F. Hickman is superintendent.

Santa Clara—This property, which adjoins the Anchor on the north, is under lease and bond to Mays & Cornielson, of Goldfield, who will put a force of men at work on development immediately.

Eureka County

The Southern Pacific railroad company is making preliminary surveys with the view of connecting the old Central Pacific line at Palisade with the Southern Pacific line in California. This will reduce the distance between southern California and Eastern markets 500 miles, and the projected line may tap the Eureka mining district. This would solve the transportation problem of the Richmond-Eureka mine which is owned by the United States Smelting, Refining & Mining Co. This line would be broad gage and transport the ores direct from the mine to the smelting plant at Midvale, Utah. There appears to be no other way of getting an outlet for these ores, as the Eureka-Palisade narrow-gage road insists upon rates that make it impossible to ship this low-grade product.

Nye County

Shipments in tons from Tonopah mines to date and for the week ended Nov. 23, are as follows:

Mines	Week	Year to Date
Tonopah Mining	3,050	157,519
Tonopah Belmont	3,525	117,894
Montana-Tonopah	1,044	48,146
Tonopah Extension	1,050	47,363
West End	950	36,227
Midway	.....	820
MacNamara	490	17,739
North Star	45	401
Mispah Extension	.....	40
Jim Butler	300	4,400
Tonopah Merger	100	100
Totals	10,554	430,649
Estimated value	$263,850	

The purchase of the Little Tonopah company's property of 21 claims for $250,000 in cash has been completed by the Tonopah Mines Corporation, a syndicate composed of John G. Kirchen, Key Pittman, of Tonopah, and Seeley W. Mudd and Frank A. Keith, of Los Angeles. A shaft will be sunk to a depth of 1000 ft., 1200 ft. northwest of the Tonopah Merger shaft.

Tonopah Merger Extension Mining Co.—This company, owning 12 claims adjoining a part of the Tonopah-Merger property, will sink a shaft to a depth of 1000 ft. This property is controlled by Frank Keller, Frank and Clarence Berry, of San Francisco.

Railroad Valley Saline Co.—This company is sinking a string of holes across the south end of the Railroad Valley potash field; one hole in each square mile. Empire drills are used, which give a 6-in. bore. This work is being done to ascertain the best place to sink a deep hole. The district is 75 miles from Ely and 125 miles from Tonopah.

Tonopah-Belmont—This company has declared its usual quarterly dividend of 25c. per share, amounting to $375,000, payable Jan. 1, 1913. This is the ninth consecutive dividend of this amount paid by the company.

Montana-Tonopah—This company has declared a dividend of 10c. per share, payable Dec. 20, on issued capital of 998,115 shares, this being the second dividend of this amount paid this year, the previous one having been distributed in June. The company is now letting contracts for a 300-ton mill on the Commonwealth mine, in Arizona, which it controls.

Tonopah Merger—This company is now making regular shipments of 50 tons of ore every other day to the old Belmont mill. As stopes are opened the output will be increased.

Tonopah Extension—The new shaft, 1200 ft. west of the present working shaft, is now down 775 ft. and cutting stringers of rich ore.

White Pine County

Boston-Ely—A few miners are at work on this property crosscutting on the 1200-ft. level. Some of the ground is very hard.

Veteran—This property is producing at about half capacity.

Giroux—Henry Krumb, consulting engineer for the Inspiration company, is examining the property of the Copper Mines Co., in conjunction with Mr. Sales, the Giroux company's engineer. President T. F. Cole was recently in the district and inspected the Copper Mines property, which, with the water rights in Steptoe Valley that it controls, may be taken over by the Giroux.

Nevada Consolidated—A deep churn-drill hole is being sunk from the next to the lowest bench in Eureka pit to test the primary ore. The smeltery is running at normal capacity.

Oregon

BAKER COUNTY

All the poles for the power-transmission line from Bourne to the dredge below Sumpter have been set and the wires are now being strung. Power will be furnished by the Eastern Oregon Light & Power Company.

Blue Mountain Mining Co.—C. L. Arzeno, president of the company, reports that the Psyche 20-stamp mill in the Greenhorn district has been purchased and will be moved to the Last Chance mine. The Psyche has been idle for some time.

Molly Gibson Gold Mining & Milling Co.—W. J. Evans, manager, reports he has all supplies that will be needed during winter and that a good force of men is at work.

Gem—This mine, in the Sparta district, is being unwatered. The pumps are lowering water 10 to 15 ft. per day. There is a modern 10-stamp mill and power machinery.

Rainbow—United States Smelting, Refining & Mining Co., which purchased this mine two years ago, has started the mill; 100 miners are at work. There is ore blocked out to keep the mill running for several years. Power is furnished from the Swan Falls electric plant, which is owned by the company.

Texas

BRAZORIA COUNTY

Freeport Sulphur Co.—The first production of sulphur at Bryan Heights was made on Nov. 19. Superheated water was pumped into one well at 9:30 a.m. on Nov. 18; at 8 a.m. the next morning compressed air was turned in and the well produced for 30 min. and then at intervals until Nov. 20. In a total period of 15 hr., an output 200 tons of sulphur was obtained. Production was then discontinued pending the completion of some alterations such as are incident to starting up any new plant, after which operations were to be resumed.

Utah

JUAB COUNTY

Iron Blosson—Preparations are being made for sinking a winze from the 600-ft. level of the No. 3 workings. This will prospect the northern end of the property at depth, and driving and crosscutting will be done. The annual meeting will be held at Provo Dec. 7.

Dragon Consolidated—Copper ore is being followed on the 700-ft. level of the No. 1 workings. About 125 tons of iron ore is being shipped daily.

Black Jack—The north drift on the 300 level is within 250 ft. of the surface cropping, which is its objective point.

SALT LAKE COUNTY

New Utah-Bingham—The Utah-Bingham has been reorganized under this name. The property adjoins the Telegraph mine, and consists of 150 acres. Development so far has been by means of an 1100-ft. tunnel, and a 150-ft. shaft, from which driving and crosscutting have been done. Active development is to be undertaken, and the ore-bearing limestone further prospected. Most of the stock is held in Europe.

Alta Consolidated—Good ore is being developed on a level with the bottom of the Brooklyn shaft. This has been driven on for 15 ft., and crosscut for 11 ft., with the work still in ore. The company is making regular shipments.

SUMMIT COUNTY

Park City shipments for the week ended Nov. 23 amounted to 3,215,950 lb. The shippers were the Silver King Coalition, Daly-Judge, Daly West, and Silver King Consolidated.

Thompson Quincy—Raising has been done several hundred feet above the 1200 level of the Daly West. There has been considerable difficulty with water. Driving is being done from the 900-ft. level of the Daly West to cut the main raise. This work will do away with water difficulties, and afford better ventilation.

Silver King Consolidated—A shipment of high-grade galena and carbonate ore has been made from new workings below the 1550 level.

Daly West—The new 1000-ft. pipe line connecting the mill with the water supply is finished, and the mill is treating 200 to 300 tons of ore daily.

McKinley & Roosevelt—Work has been resumed at this property, which consists of nine claims, near the Ontario, St. Louis, East Ontario, and American Flag. A shaft is being sunk in hitherto unprospected ground.

TOOELE COUNTY

Honorine—Lessees are mining and making regular shipments.

Bullion Coalition—Excess water from the Honorine drain tunnel is being used to irrigate farm land owned by this company, at the mouth of the tunnel.

Ben Harrison—Lessees shipped 11 cars of ore of medium grade in October. November shipments thus far amount to four cars. Most of the ore is coming from development work.

Galena King—The Tintic Leasing Co. has sold to the company its leasing rights, which have still another year to run. One car of ore is ready for shipment.

UTAH COUNTY-SANTAQUIN DISTRICT

Santaquin Chief—Ore has been followed to the 210-ft. level in the western end of the property.

Union Chief—Sixty tons of ore were shipped recently from the upper workings. During September over 200 tons were shipped. The October shipments were less on account of the roads being blocked with snow.

Santaquin King—A new road is being built to this property. Ore has been followed to a depth of over 130 ft., from which shipments will be made in the near future. This ore carries a large excess of iron, and is a desirable fluxing ore.

Washington

FERRY COUNTY

Anaconda Gold—As soon as the 80-hp. oil engine is installed, operations at this property, near Republic, will be increased. A new compressor has been installed and is ready for work.

Ben Hur—Operation of this mine has been resumed, and the monthly ore production is running from $20,000 to $24,000. This property is being operated by Doctor Kingston and associates, of Republic.

STEVENS COUNTY

Bonanza—Some fine ore has been encountered at this mine, near Bossburg, and operations are to be resumed.

Bornite—While working in the main tunnel on this property, in the Newburg district, ore assaying about $6 per ton was uncovered. The work is in charge of Frederick Shilling, and improvements are planned.

United Copper—The fourth consecutive monthly dividend of $10,000 was paid Nov. 20. The net total output for last month was $26,000.

Amazon—The crosscut tunnel has just cut a second vein carrying high-grade milling ore.

Copper Cliff—Work has been resumed on the No. 2 crosscut tunnel under the direction of Thomas Wilson.

Wisconsin

PLATTEVILLE DISTRICT

Furnace Drilling Co.—David Gardner, Sr., and associates, have begun drilling on the Straw land, within the city limits of Platteville.

Klar-Piquette—Two Keystone drills, at work on the Hellmer and Heffernan farms, south of Platteville, have struck rich jack ground.

Preston Point—W. N. Tiffany has taken an option on the mine and milling plant at Potosi.

Frontier—This company has struck the range on the Grotkin land, and has taken over the Hoffman lease.

Shamrock—Goldsworthy & Heffren are building a milling plant on the old Peni range, at Mifflin.

Platteville-Linden—Pollard & Harker have secured control of this property and will reopen the mine at Linden.

Murray—A. L. Utt has commenced drilling this lease, just east of the Jarrett mine, near Cuba City.

Wisconsin Separating Co.—This company has obtained a lease on the Lyght mine, south of Platteville; the Hodge and Trego mines, at Platteville, and the Fever River, at Cuba City, have recently been acquired and will be operated to supply separator ore to the roasting plant, at Benton.

Wyoming

It is reported that a seven-year contract, which involves the sale of fuel oil to the extent of more than $5,000,000, has just been closed by the Midwest Oil Co., with the Chicago & Northwestern R.R. From now on the only fuel to be used on this road, west of the Missouri River and on one division east of the river, will be Wyoming oil. The deal was closed during a recent visit to Chicago by Carl Schuyler, general counsel for the Midwest company, and R. D. Brooks, of Denver, general manager. The contract stipulates a sliding scale on the delivery of the oil, by which the railroad company will take from 1500 to 3500 bbl. of oil per day from the Midwest company, at Casper.

Canada

British Columbia

Society Girl—Fourteen inches of fairly clean galena is reported to have been struck on this mine, near Ymir. Driving has disclosed a vein about two feet wide.

Hedley Gold Mining Co.—A settlement at the rate of $50 per ton is reported to have been received on a carload of ore, shipped by Buffer & Rice, lessees, from the Nickel Plate mine, at Rossland.

Granby Consolidated—During October 112,397 tons of ore was shipped from the mines, the average daily shipment being 3875 tons. In development work, 390 ft. of raising, 668 ft. of driving, 132 ft. of sinking and 1217 ft. of diamond drilling was done. At the smelting 763 tons of ore was received; 112,247 tons of Granby and 1213 tons of foreign ores were smelted.

Nova Scotia

Nova Scotia Steel & Coal Co.—The entire iron-ore tonnage for next year has been sold at a satisfactory price. In addition to supplying their own furnace requirements, the company has been annually selling about 200,000 tons of its Newfoundland ore to the United States and about the same amount to British and German purchasers.

Ontario

Ophir—At this mine, in the Lake of the Woods district, a vein 8 ft. wide, situated nearly half a mile from the shaft, has been uncovered for about 50 ft., much of it showing visible gold.

Ontario—Cobalt

Shipments of ore and concentrates, in tons, from Cobalt for the week ended Nov. 22, and for the year to date, were:

Bailey	.....	21.57
Beaver	.....	363.75
Buffalo	.....	989.50
Casey Cobalt	.....	255.15
Chamb.-Ferland	.....	427.83
City of Cobalt	.....	914.99
Cobalt Lake	.....	860.88
Cobalt Townsite	62.50	1,729.02
Colonial	.....	63.14
Coniagas	.....	1,874.33
Crown Reserve	.....	417.82
Dominion Reduction Co	.....	56.64
Drummond	.....	383.05
Hudson Bay	.....	631.20
Kerr Lake	30.83	743.05
La Rose	33.05	3,231.09
Lost & Found	.....	27.80
McKinley-Darragh	43.55	2,350.99
Nipissing	.....	1,735.62
O'Brien	.....	325.43
Penn.-Canadian	.....	97.90
Provincial	.....	22.22
Right of Way	.....	242.82
Seneca Superior	47.10	195.63
Timiskaming	.....	884.56
Trethewey	.....	504.89
Wettlaufer	.....	406.96
Totals	217.03	19,757.83

The Trout Lake smeltery, which was originally built for smelting Cobalt ores, has been purchased by men identified with the Island Smelting Co., of Toronto.

Provincial—An effort is being made to have the 10% royalty to the government reduced.

McChesney-Perkins—On these claims in the Wigwam Lake district of the Gowganda camp, the finding of a good vein from four to eight in. wide, showing native silver, is reported.

La Rose—The statement of earnings for October shows a total income of $161,399; expenses, $64,307, and net profit $97,092. In the first ten months of the year 2,272,584 oz. of silver was produced, the income being $1,433,080, the expenses $655,784 and the net profit $777,296. The cash surplus was $1,328,293, which with amounts of outstanding shipments, etc., makes a total surplus of $1,658,881. The company has made another five-year contract for the treatment of low-grade ore at the Northern Customs concentrator, calling for the delivery of 100 tons per day.

Ontario—Porcupine

Cartwright—This company, in Beattie township, will build a small milling plant. The shaft is down 40 ft. and rich ore is being cut.

Little Pet—Arrangements are being made to have this property reopened.

Crown Chartered—The directors announce the finding of a vein 18 to 24 in. wide, showing abundant free gold, on the North Davidson claims. It has been stripped for 30 feet.

Jupiter—Development on the 300-ft. level has encountered pay ore. More drills will be put to work.

Hudson Bay—This Cobalt company is seeking to acquire properties in Porcupine. Manager A. H. Brown is sampling the Maidens claims in Deloro township, with a view to taking an option.

Mexico

Sonora

Democrata—Delays in the arrival of supplies have caused a postponement of the blowing in of the new smeltery, which has a capacity of 250 tons of ore per day. The new electric hoist at the mine is about ready for use. Underground work consists principally of retimbering some of the main drifts and preparing the mine for steady production. When operating at full capacity between 450 and 550 tons monthly.

Sante Fé—This placer property, in the Altar district, is reported to have been sold to Americans; it was owned by Emilio Gonzales, of Nogales, and associates.

El Pilar—This mine, near Santa Cruz, has 400 tons of ore at the railroad ready for shipment to the Cananea smeltery. A. O. Koppes is in charge.

Mexican Metals Co.—The property of this company is being operated regularly, and the 100-ton mill is turning out rich concentrates. The mill is to be enlarged.

Abundancia—Charles Schandelmier has a lease on this property, also known as the West Cananea. Shipments are being made to the Cananea smeltery; 20 to 26 men are employed.

Superior-Bonanza—At this mine, six miles west of Imuris, the tunnel which will be used to haul ore to the proposed railroad and as a drain for the shafts is nearly completed. During October 266 ft. of tunnel was driven. The total length will be 1400 feet.

Maria—This mine adjoins the Chispas mine of the Minas Pedrazzini company. Work will soon be resumed by R. B. Phillips, manager, after five or six months of inactivity.

Transvaal—A small force of men is at work at this mine, near Cumpas. H. C. Beauchamp is in charge.

Las Animas—The management of this property, at San Xavier, is planning to put the leaching plant in operating condition. The property is producing regularly, shipping high-grade ore and silver bullion to the El Paso smeltery.

Spain

According to a cable dispatch to the New York *Sun*, an alluvial gold field has been discovered in the province of Leon, in the northwest of Spain, and prospecting is being conducted by a syndicate in which Eugene de Sabla and Ernest Wiltsee represent American interests. The syndicate is buying up land in the vicinity of the discovery.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

Coal Trade Review

New York, Dec. 4—The situation in the West is improving a little, the close of the Lake trade having released more cars for general work. The Seaboard bituminous trade is also easier, supplies of coal being on a larger scale, especially from West Virginia. Anthracite supplies are also coming out more freely. The collieries have been working steadily and less coal is going West. The continued mild weather has eased up the immediate demand, and there is less pressure for deliveries.

Russian Coal—Coal output in Russia, six months ended June 30, metric tons:

	1911	1912	Changes
Anthracite	1,277,000	1,617,000	I. 340,000
Bituminous	11,108,000	12,347,000	I. 1,239,000
Lignite	64,000	77,000	I. 13,000
Total	12,449,000	14,041,000	I. 1,592,000

Coke made this year was 1,829,000 tons; briquettes, 59,000 tons. The figures do not include the Siberian mines.

German Coal Production—Coal production of German Empire, nine months ended Sept. 30, metric tons:

	1911	1912	Changes
Coal	119,791,173	131,301,978	I. 11,510,805
Brown coal	53,352,999	59,712 668	I. 6,359,669
Total mined	173,144,172	191,014,646	I. 17,870,474
Coke made	18,726,549	21,187,617	I. 2,461,068
Briquettes m'de	16,023,883	17,918,209	I. 1,894,326

Of the briquettes reported this year 13,971,271 tons were made from brown coal or lignite.

Austrian Coal Production—Coal production in Austria, nine months ended Sept. 30, metric tons:

	1911	1912	Changes
Coal	10,775,397	11,656,476	I. 881,079
Brown coal	18,710,953	19,490,252	I. 779,299
Total	29,486,350	31,146,728	I. 1,660,378

Coke made this year was 1,716,143 tons; briquettes made, 296,208 tons, of which 175,353 tons were made from brown coal or lignite.

Iron Trade Review

New York, Dec. 4—Not much change is to be reported in the general position of the iron and steel trades, and no special advances in quotations are noted.

There has been an increase in inquiry for finished steel products on contract for the second half of the new year, following the lull in interest noted last week. This is now attributed in some quarters to the impending holiday, though why that should be the case is not clear. Despite the reported improvement, it is probably true that forward business in steel products is materially less in volume than it was 30 or 60 days ago. The mills state that they are endeavoring to discourage buyers from contracting so far ahead, but are accepting contracts occasionally for third quarter in certain products, particularly bars, plates and shapes. In other cases they have accepted business for specifications not later than June 30 which will involve delivery in third quarter. The mills are now so far behind in deliveries, having an average of nearly three months of output specified on books, that they do not expect to be caught up by July 1 if demand and general conditions continue good.

The pressure upon mills for deliveries continues heavy, and specifications currently being received, while below the average of 30 or 60 days ago, are up to the average of the past five or six months. This means that they continue to exceed the current shipments.

In the pig-iron market the demand for foundry iron has eased off a little, though there is still much inquiry for future deliveries. Basic is being taken freely and orders for this grade are large. Prices are firmly held and furnaces are not making concessions. Coke is in a little better supply.

Testing Steel Rails—The Rail Committee of the American Railway Engineering Association is utilizing the 800,000-lb. Riehle machine in the Fritz Engineering Laboratory, at Lehigh University, South Bethlehem, Penn., for important tests of rails, as a part of the research work undertaken jointly by the railroads and steel manufacturers. M. H. Wickhorst, of Chicago, engineer of tests of the Rail Committee, is in charge of the work. In the work at South Bethlehem he is being assisted by members of the civil-engineering department of Lehigh University.

Baltimore

Dec. 2—Exports for the week included 4,123,540 lb. steel rails and 371,988 lb. rail fastenings to Puerto Barrios, Guatemala; 136,814 lb. miscellaneous iron and steel and 196,868 lb. tinplates to Havana; 8,196,501 lb. structural and other steel to Panama; 1,893,800 lb. steel billets and 939,640 lb. steel bars to Liverpool. Imports included 7480 tons pyrites from Huelva, Spain; 19,650 tons iron ore from Cuba.

Birmingham

Dec. 2—While the pig-iron trade in Southern territory during the last few weeks has been only fairly active, indications are encouraging. Sales already made for delivery during the first quarter of 1913 call for a large tonnage and inquiries in hand provide for practically the probable make. Some inquiries have been received for pig iron to be delivered during the latter part of the year, but so far very little such business has been booked. The quotations are firm at $14.25 @15 per ton, No. 2 foundry.

Basic iron is in strong demand and several furnaces are being kept busy supplying the demand. The steel activity in the South promises to keep up for several months to come, and this warrants a steady operation of furnaces on basic iron. One of the steel mills furnishing rods for concrete work is behind in deliveries and can hardly catch up with the demand. Rails are also in strong demand and the plant of the Tennessee company will be busy through the entire coming year. Cast-iron pipe is still in demand.

Further shipments of pig iron on export orders were made during the past week.

Preparations are being made in the Birmingham district for deep ore mining and to test opinions expressed by geologists as to the existence of much ore under the present seams. Preparations are on for the development of Clinton ore fields on an elaborate scale.

Chicago

Dec. 3—Quiet conditions continue in the pig-iron market; sales of iron and steel products are large. The foundrymen are slackening their buying of pig iron because the inventory season is approaching and their stocks for current needs are ample; until after the new year there is not likely to be any pronounced activity in pig iron. A few sales of more than 300 tons have been made in the last week; most of the purchases are under that figure. First-half sales have been numerous for the last three months; few, if any, have gone into the third quarter.

Under these conditions, prices remain remarkably firm. Southern No. 2 is quoted at $14, Birmingham, as a minimum, which means $18.35, Chicago. Northern No. 2 holds to $18 at furnace, making the delivered price about $18.50. There is no difference between early and

late deliveries, so far as the market goes. Charcoal iron remains at $18.75, Chicago, the demand meeting the supply.

In finished products the greatest activity is in railroad supplies. The railroads are now buying very freely and they seem likely to continue doing so. Local producers are not seeking business; they are with difficulty attending to the large amount that comes in. Structural material continues to be in large demand; interest now centers around the possibility of deliveries in the second half of 1913; even these in many cases are difficult of assurance. Sales of bars, both iron and steel, are limited only by the capacity of the mills, at high prices. Plates, sheets and minor lines are active whenever deliveries can be guaranteed; the pressure on the producers is great in every line.

Cleveland

Dec. 2—The Lake season is nearing its end. Dec. 1 is the closing date on all insurance policies.

Pig Iron—The market is rather quiet, but firm, and no concessions are being made. For Cleveland delivery quotations are $18.50 for bessemer, $17 for basic and $17.75@18 for No. 2 foundry.

Finished Material—Some structural and bridge contracts are reported. Plates and bars continue active. There is no letup in the pressure on mills for deliveries.

Philadelphia

Dec. 4—Notwithstanding the far oversold condition of the blast furnaces of this district, contracts for large quantities of all kinds of pig have been made for delivery ranging from the early part of the year to midsummer. Foundry iron is in lighter demand than most other kinds, the purchases being limited largely to specific necessities. Basic and bessemer have been very freely handled and forge has been contracted for on quite a liberal scale. There are still three or four large consumers who are figuring upon supplies to be delivered throughout the first half of the year, but there is some hitch in the deals which has not been explained. Low-grade iron for pipe work continues to strain furnace capacity. The cost of coke, coal and labor remains a threatening factor in the background. Most furnaces have made heavy purchases of ore from both foreign and domestic source. It has been found impossible to make satisfactory arrangements as to coke. No. 2X foundry is held as high as $18.75, with Virginia a little higher; gray forge, $17.75; basic, $18.50; low-phosphorus, $24 minimum.

Billets—Recent heavy orders have piled up manufacturers as to early deliveries and business is now being done extending in a few cases to the end of the second quarter, as the first quarter is taken up excepting for small lots at premium rates.

Bars—Bars continue very active and car-building requirements are crowding mill capacity to the limit. Prices are moving up fractionally. The greater demand is now for common iron. Quotations: 1.60c. for steel bars, delivered, 1.85c., and early deliveries for iron bars as high as 2c., though quoted in large lots at low as 1.77½ cents.

Sheets—Sheets are active and some business offered a week ago is still under consideration over the question of delivery.

Plates—Sheared plates have brought as high as 1.80c., universal 1.85c., plain 1.75c., with business in large quantities at some shading from these figures.

Structural Material—Most of the business of the past week has had reference to the closing of earlier negotiations. New inquiries have been rather light.

Rails—The Pennsylvania has added 50,000 tons to its order, the Reading has ordered 25,000 tons and about an equal quantity has been ordered by Southern roads, and there is a reported inquiry from New England.

Scrap—Buyers of scrap are not in all cases receiving the supplies promised, and dealers are scouring the country endeavoring to fill their contracts.

Pittsburgh

Dec. 3—Finished steel prices are stationary. There has been no important advance for six or seven weeks, the last increased in a fundamental product being the advance in sheets to 2.25c., about the middle of October.

The Carnegie Steel Co. is making excellent headway in getting its Edgar Thomson and Homestead works back into full operation since the almost complete tie-up at these plants from the strike which started Nov. 22. Ten Edgar Thomson blast furnaces had been operating, and all were banked; eight having now resumed, with the other two expected in by tomorrow. Four of the seven Carrie furnaces were also banked, but two have resumed and the other two are expected to resume in a day or two. A corresponding decrease occurred in operations at the attendant steel mills, which are getting back into full operation this week. The strike was of men operating locomotives in these plants. These men demanded the same wages as are paid on the Union R.R., the company's terminal railroad, and were they granted that basis they would probably have been taken into the union which operates on the Union Railroad. The increase has not been granted.

Pig Iron—The bessemer and basic pig-iron averages, compiled from actual sales, are announced for November at $17.172, Valley, for bessemer, an increase of 17.2c. over October, and at $16.192, Valley, for basic, an increase of 0.8c. over October. The small increase in the basic average is attributed to the fact that some large sales were made at $16, Valley, when the market was quoted at $16.25, and when $16.25 had been obtained even in October. About 100,000 tons figured in the bessemer compilation, chiefly tonnage already mentioned in these reports. In the basic average about 62,000 tons figured. Basic Mahoning Valley, blew out last week for relining, and the company is selling its coke in the market in the interim. sales in the month were larger, but involved some large tonnages sold by a furnace not in the Valleys, and therefore not possible to include. The pig-iron market has been quiet during the past week, but very firm, as the furnaces are well sold up. Struthers furnace, in the Mahoning Valley has gone out of blast. Prompt furnace coke has been a shade easier, at $3.90@4. One of the largest contracts of the season has just been closed, the Wheeling Steel & Iron Co. closing with a Pittsburgh brokerage house, which has had the contract for two years, for its requirements for 1913, about 30,000 tons a month, the price being a shade above $3. Another consumer contracted for about 8000 tons a month over the year at about $3.10. We quote pig iron as follows: Bessemer, $17.25; basic, $16.50; No. 2 foundry, $17.25@17.50; forge, $16.75@17; malleable, $17.25@17.50, f.o.b. Valley furnaces, 90c. higher at Pittsburgh.

Ferromanganese—Several sales of prompt and December ferromanganese are reported at $75, Baltimore. For contracts over second half $61.50, Baltimore, is still quotable, but for second quarter alone $62.50 is named and for first quarter $65, Baltimore.

Steel—Quotations up to almost $30, Pittsburgh, have been made on sheet bars when a considerable tonnage was inquired for. The market is practically unquotable, sales being very limited. We repeat last week's quotations, although they are practically nominal: Bessemer billets, $27; bessemer sheet bars, $27.50; openhearth billets, $28; openhearth sheet bars, $28.50, f.o.b. maker's mill, Pittsburgh or Youngstown. Rods are $30, but are growing scarce at that price.

Sheets—The sheet market grows stronger each week as the number of sellers at the base prices decreases. For any early delivery it is now possible to obtain premiums, and even contracts for first quarter are going at premiums in the majority of cases. We quote: Black sheets, 28 gage, 2.25@2.35c.; galvanized, 28 gage, 3.40@3.50c.; blue annealed, 10 gage, 1.65@1.75c.; painted corrugated, 2.45@2.50c.; galvanized corrugated, 3.45@3.50c. per pound.

St. Louis

Dec. 2—The pig-iron market is in good shape. The demand is fairly active for first-half deliveries; there is any amount of second-half inquiries, but as yet not much business is being done on these. Prices remain about the same, $14@14.50, Birmingham, or $17.75@18.25, St. Louis, for No. 2 Southern foundry. Northern iron is being quoted around $19, St. Louis.

Coke is still on the advance, Connellsville being quoted around $6.50, and by-product $6, St. Louis.

Iron Ore Trade

Sales of Lake ore so far have been chiefly of bessemer ores, the nonbessemers going rather slowly. Ore sellers have decided to eliminate the premiums which have been obtained for a number of years on nonbessemer ores of 53% and above in iron in the natural state. Another important change in the contracts which are now being written provides that furnaces having ore on lower Lake docks at the taxing time in April must pay the taxes. This change results from a controversy of long standing between the ore interests and taxation officials as to how ore on docks should be taxed.

Prices of Port Henry, N. Y., ores to furnaces have been fixed for 1913 at an advance of 50c. per ton over this year.

Imports and exports of iron and manganese ores in the United States, nine months ended Sept. 30, long tons:

	1911	1912	Changes
Iron ore, imp.....	1,362,352	1,539,452	I. 177,100
Iron ore, exp.....	134,645	181,629	I. 46,984
Manganese, imp....	579,538	893,924	I. 314,386

Imports of iron ore this year included 61,706 tons from Canada; 68,701 from Spain; 100,335 from Newfoundland and Labrador; 280,309 from Sweden; 1,016,343 from Cuba.

Sault Ste. Marie Canal Traffic

The total freight passing through the Sault Ste. Marie canals in October was 10,716,791 tons, the largest tonnage ever reported for one month. The total freight for the season to Nov. 1 was, in short tons:

	1911	1912	Changes
East-bound.....	32,230,708	48,254,518	I. 16,023,810
West-bound.....	15,129,031	14,414,981	D. 714,050
Total.....	47,359,739	62,669,499	I. 15,309,760

The total number of vessel passages this year was 19,998, showing an average cargo of 3150 tons. The mineral freights included in the totals were as follows, in short tons except salt, which is given in barrels:

	1911	1912	Changes
Coal.....	13,664,445	12,619,404	D. 1,045,049
Iron ore.....	28,243,341	42,177,817	I. 13,934,471
Pig and mfd. iron.	373,219	542,460	I. 169,241
Copper.....	104,444	89,988	D. 14,456
Building stone.....	4,367	2,282	D. 2,085
Salt, bbl.....	550,778	566,487	I. 15,709

Iron ore was 67.3%, and coal 20.1% of the total freight this year.

METAL MARKETS

New York, Dec. 4—The metal markets continue fairly active, with only moderate changes in quotations.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold			
Oct. 1912..	$ 330,270	$ 11,887,492	Imp. $11,557,222
" 1911..	3,983,994	4,102,427	Imp. 118,433
Year 1912..	44,058,544	50,677,285	Imp. 6,618,741
" 1911..	22,247,304	49,279,533	Imp. 27,032,229
Silver			
Oct. 1912..	6,171,820	4,683,784	Exp. 1,488,036
" 1911..	5,087,087	3,404,458	Exp. 1,682,629
Year 1912..	58,519,766	40,985,536	Exp. 17,534,230
" 1911..	54,615,048	37,100,888	Exp. 17,514,160

Exports from the port of New York, week ended Nov. 30: Gold, $41,225; silver, $1,160,673, chiefly to London. Imports: Gold, $351,463; silver, $258,914, from Mexico, Cuba and South America.

Gold—Prices on the open market in London remained at the usual level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. A total of $4,250,000 gold is reported taken in London for export to New York.

Iridium—This metal is still quoted at $67@70 per oz., New York.

Platinum—The market, which has recently been advancing, holds its gain. Small lots (4 or 5 oz.) now command $46 per oz., but large lots can be obtained at about $45. We quote $45@46 per oz. for refined platinum, and $47.50@48.50 per oz. for hard metal, up to 10% iridium.

Our Russian correspondent writes, under date of Nov. 21, that the market and the prices are steady. The last fortnight considerable quantities of platinum have been sold. The starateli works are reduced and therefore the offer of platinum by them has diminished. The quotations are, St. Petersburg, 37.700 rubles per pood; at Ekaterinburg, 9.80 rubles per zolotnik—equal to $36.95 and $36.85 per oz., respectively, for crude metal, 83% platinum.

Silver—The statement that the Indian government had renewed buying orders, together with the fact that the large silver operators were taking their future contracts as they became due, tended to produce a scarcity of spot silver, covering by the shorts, and an advance in the price to 29 11/16d. in London.

SILVER AND STERLING EXCHANGE

Nov.-Dec.	28	29	30	2	3	4
New York....	....	63⅛	63⅛	63⅞	64⅛	63⅝
London.....	29⅝	29 3/16	29⅜	29 5/16	29 11/16	29 7/16
Sterling Ex..	....	4.8465	4.8450	4.8435	4.8445	4.8450

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper, Tin, Lead and Zinc

NEW YORK

Nov.-Dec.	Copper: Lake, Cts. per lb.	Copper: Electrolytic, Cts. per lb.	Tin: Cts. per lb.	Lead: New York, Cts. per lb.	Lead: St. Louis, Cts. per lb.	Zinc: New York, Cts. per lb.	Zinc: St. Louis, Cts. per lb.
28	.....	.....	....	....	....	.....	.....
29	17½ @17¾	17.35 @17.45	49⅜	4.45 @4.50	4.30 @4.32½	7.25 @7.30	7.10 @7.15
30	17½ @17¾	17.35 @17.40	49¾	4.45 @4.50	4.30 @4.32½	7.25 @7.30	7.10 @7.15
2	17½ @17¾	17.35 @17.40	50	4.40 @4.45	4.27½ @4.32½	7.20 @7.30	7.05 @7.15
3	17½ @17¾	17.35 @17.40	49¾	4.35	4.20	7.20 @7.30	7.05 @7.15
4	17½ @17¾	17.35 @17.40	49⅝	4.35	4.20	7.20 @7.30	7.05 @7.15

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

Nov.-Dec.	Copper: Spot	Copper: 3 Mos	Copper: Best Sel'td	Tin: Spot	Tin: 3 Mos	Lead, Spanish	Zinc, Ordinaries
28	76⅝	77⅜	82½	226½	226¼	18 1/16	26¼
29	76¼	77	82	226	225½	18 1/16	26¼
30	....	....	....	.....	.....	....	....
2	76⅞	77⅝	83	228¾	227⅛	18⅛	26⅛
3	76 11/16	77½	83	227¼	226¼	18⅛	26⅛
4	76⅞	77¼	82¾	225½	224¾	18 1/16	26½

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = = 21¾c.

Copper—Dullness continued through the last three days of November. European demand was absent. Domestic buyers continued to purchase in a hand-to-mouth way and secured what they needed at 17½@17⅝c., delivered, usual terms. Since Dec. 1 the market has been almost stagnant. Most of the producers maintain their confidence in a return to the pegged price, but one of the larger that has heretofore been holding aloof is reported to have solicited business at the lower level. The sales for Lake copper during the week have been insignificant.

Many of the Lake producers have shipped away all the copper on their wharves in anticipation of the closing of navigation, wherefore the refinery statistics for November ought to show relatively large deliveries of Lake copper. At the close, Lake copper is quoted at 17½@17¾c.; electrolytic in cakes, wirebars or ingots, 17.35@17.40c., while casting copper is quoted nominally at 17.20@17.25c. as an average for the week.

In London, the market for standard copper has fluctuated within narrow limits. It closed on Nov. 28 at £76 12s. 6d. for spot and £77 7s. 6d. for three months. On Monday, Dec. 2, it was 5s. above these prices, but some bear speculation made its appearance, and the market closes somewhat lower, at £76 7s. 6d. for spot and £77 5s. for three months.

Copper sheets are 23@24c. per lb., base for large lots; full extras are charged and higher prices for large quantities. Copper wire is 19@19¼c. base.

Copper exports from New York for the week were 6251 long tons. Our special correspondent gives the exports from Baltimore at 2774 tons for the week.

Tin—Both the American and European statistics published the beginning of this month showed clearly the excellent position of this metal. The response of the London market to the favorable figures disclosed by the European statistics was an advance of almost £3 per ton on Dec. 2. This, however, was not maintained. The market became weak and continued its decline both on Dec. 3 and 4. The spectacular advance at the beginning of the week did not attract buyers who seem to be distrustful of it, and this is given as the reason for the market's equally rapid collapse. The close is £225 10s. for spot and £224 15s. three months, and about 49½c. for December tin.

Visible stocks of tin, Dec. 1, are reported as follows: Great Britain, 6181; Holland, 2517; United States, excluding Pacific ports, 3650; total, 12,348 long tons.

Lead—The market is quiet and weakish. When the A. S. & R. Co. reduced its price to 4.50c., New York, it was promptly undersold by the independents and the market quickly fell away from the price named by the largest seller. On Dec. 3 the A. S. & R. Co. made a further cut to 4.35c., New York. Since then the market has been stagnant, both buyers and sellers being at a loss to know what to do. The former are doubtful whether the bottom has yet been reached and the latter are apparently uncertain as to the advisability of making further cuts in order to attract business. The market closes at 4.35c., New York, and at St. Louis at 4.20c. nominally.

The London market is slightly firmer; good Spanish lead is quoted £18 3s. 9d., and English 2s. 6d. higher.

The average price of lead for the week ended Dec. 4 was 4.415c., New York.

Spelter—The conditions outlined in our last report led to some lower offerings, spelter for January delivery being tendered liberally on the basis of 7.10c., St. Louis. However, the few buyers needing spelter for prompt delivery were obliged to pay a premium, especially during the early part of the week. The smelters of Kansas and Oklahoma who may have a December surplus are reluctant to sell too closely so early in the month, in view of the advent of cold weather, which may interfere with their gas supply. During the latter part of the week, however, more spelter seems to have become available for December delivery, reports being current that importations of European spelter are afloat. These will tend to relieve the scarcity for prompt metal that has prevailed for so long a time past. It is fortunate that the European market has been able to spare some metal for shipment to the United States, since otherwise the price of spelter might have risen to an unhealthily high level. At the close St. Louis is quoted at 7.05@7.15c., according to delivery, and New York at 7.20@7.30c. per pound.

At the lower prices for spelter, which were recently established in Europe, there was quite a large demand, which pretty well absorbed the available supplies, and good ordinaries, which, on Nov. 28, closed at £26 5s., on Dec. 2 advanced to £26 10s., at which figure it closes today for good ordinaries, with specials £26 15s. per ton.

Base price of zinc sheets is $9 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Zinc dust is quoted at 7½@7⅝c. per lb., New York.

Other Metals

Aluminum—The market for the past week has been rather dull, with more metal for early deliveries. Quotations are practically unchanged, at 25½@26c. for No. 1 ingots, New York.

Antimony—The market has been a little more active and the liquidation in the outside brands seems to be over. Cookson's is unchanged at 10.20@10.50c. per lb.; Hallett's is quoted at 9.75@10c. The other varieties are a little firmer, 9.12½@9.37½c. being asked for Hungarian and Chinese.

Quicksilver—Business is quiet and the quotations, while nominally unchanged, are really a little easier. New York prices may be given at $41@42 per flask of 75 lb., with 58@60c. per lb. asked for retail lots. San Francisco, $41.50 for domestic orders and $39 for export. London price is £7 12s. 6d. per flask, with £7 10s. named from second hands.

Zinc and Lead Ore Markets

Platteville, Wis., Nov. 30—The base price paid this week for 60% zinc ore was $56@58. The base price paid for 80% lead ore was $52@54 per ton.

SHIPMENTS WEEK ENDED NOV. 30

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Benton	1,081,200	.....	840,700
Platteville	738,170	.....	198,000
Mineral Point	701,410	.....	.....
Highland	369,400	.....	.....
Shullsburg	354,400	61,400	.....
Hazel Green	340,000	.....	.....
Harker	224,090	.....	.....
Galena	223,400	.....	.....
Cuba City	221,320	.....	131,040
Montfort	70,000	.....	.....
Total	4,323,390	61,400	1,169,740
Year to date	184,382,190	7,491,160	35,834,450

Shipped during week to separating plants, 2,722,950 lb. zinc ore.

Joplin, Mo., Nov. 30—The high price of the week is $61 for zinc sulphide, the base per ton of 60% zinc $55@58.50. Zinc silicate sold at $30@33 per ton of 40% zinc. The average price for all grades of zinc is $55.14. Lead sold at $54 per ton of 80% mineral, and very little ore was sold that assayed higher. The average price, all grades of lead, is $55.80 per ton. Outputting was never

SHIPMENTS WEEK ENDED NOV. 30

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	4,705,250	.....	618,350	$151,413
Joplin	4,054,410	.....	331,930	124,844
Galena	809,000	.....	142,090	26,630
Duenweg	766,420	.....	.....	21,459
Miami	551,070	.....	196,370	18,724
Alba-Neck	578,180	.....	10,470	17,048
Granby	71,500	429,110	18,440	10,365
Carl Junction	338,190	.....	.....	8,455
Springfield	198,760	.....	.....	5,963
Spurgeon	63,350	189,800	38,020	5,792
Lawton	189,140	.....	.....	5,296
Oronogo	191,410	.....	.....	5,260
Carthage	135,030	.....	.....	3,645
Jackson	127,140	.....	.....	3,433
Aurora	56,420	71,520	.....	2,626
Cave Springs	57,160	.....	8,100	1,822
Wentworth	64,930	.....	.....	1,752
Quapaw	61,490	.....	.....	1,537
Totals	13,018,850	690,430	1,363,770	$416,064
11 mos.	526,727,190	33,101,150	86,058,290	$17,115,42

Blende val., the week, $365,714; 11 mos., $14,136,073
Calamine, the week, 12,256; 11 mos., 526,326
Lead value, the week, 38,097; 11 mos., 2,453,028

MONTHLY AVERAGE PRICES

Month	Zinc Ore: Base Price		Zinc Ore: All Ores		Lead Ore: All Ores	
	1911	1912	1911	1912	1911	1912
January	$41.85	$44.90	$40.55	$43.54	$55.68	$58.92
February	40.21	45.75	39.16	43.31	54.46	52.39
March	39.85	51.56	38.45	49.25	54.57	54.64
April	38.88	52.00	37.47	50.36	56.37	54.18
May	38.25	55.30	36.79	53.27	55.21	52.45
June	40.50	55.88	38.18	54.38	56.49	55.01
July	40.75	58.85	38.36	56.59	58.81	58.83
August	42.50	55.13	41.28	53.27	60.74	57.04
September	42.63	59.75	41.29	57.07	59.33	61.26
October	42.38	57.00	40.89	55.97	54.72	63.22
November	45.40	55.69	43.25	53.98	57.19	56.55
December	44.13	.....	40.76	.....	62.08	.....
Year	$41.45	.....	$39.90	.....	$56.76	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore: the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

so great as now, and reaches 6500 to 7000 tons per week. There is a strong and continuous demand for all the ore produced.

Chemicals

New York, Dec. 4—The general markets continue active, with a good business forward in most lines.

Arsenic—Supplies are now up to demand and the market is quieter. There is report that the Canadian producers have shut down, but it is not confirmed. Quotations are $4.87½ per 100 lb. for both spot and futures.

Copper Sulphate—Trade is fair and prices are unchanged at $5.50 per 100 lb. for carload lots, and $5.75 per 100 lb. for smaller parcels.

Nitrate of Soda—Quotations remain at 2.60c. per lb. for spot and futures up to April 30. Futures are a little easier at 2.57½c. for May, 2.55c. for June and 2.52½c. for July and later deliveries.

Current Wholesale Prices

Ammonium sulphate .....cwt.	3.15@3.25
Arsenic, white.....lb.	0.04½@0.05¼
Barytes, ground .....sh. ton	12.50@14.00
" floated.....sh. ton	16.00@17.00
Calcium acetate, gray .....cwt.	2.50@2.55
carbide, tons lot f.o.b. Niagara Falls. . .sh. ton	70.00
Carbons, good drill quality....carat	85.00
Cement, Port., Am. .....400-lb. bbl.	1.33
Chrome brick, f.o.b., Pittsburgh. .M.	175.00
ore, 50%, ex-ship, N. Y., lg. ton	14.00@16.00
Copperas, bulk.....cwt.	0.55
bbl.....cwt.	0.65@0.85
Copper sulphate.....cwt.	5.50@5.75
Fluorspar, lump, f.o.b. Pittsburgh.ton	8.00@9.00
Magnesite, crude, 95%. . . .lg. ton	10.00@11.00
calcined, powdered.....	30.00@35.00
brick, dom., f.o.b. Pittsburgh.....M.	160@180
Paints, litharge, Am. powd.....lb.	0.06½@0.07
red lead, American.....lb.	0.06½@0.07
white lead, Am., dry.....lb.	0.05½@0.05¾
zinc white, Am., dry.....lb.	0.05¾@0.06½
Phosphates, acid:	
*Fla., hard rock 77%.....	5.75@6.25
land pebble 68%.....	3.70@3.80
†Tenn., 78@80%.....	5.00@5.50
75%.....	4.75@5.00
68@72%.....	4.25@4.50
‡So. Car. land rock 60%.....	3.50@3.75
Potassium cyanide, 95@96%....lb.	0.24
Pyrite:	
Domestic, non-arsenical, furnace size, f.o.b. R.R. per unit.....	0 12@0.12½
Domestic, non-arsenical, fines, per unit, f.o.b. mines.....	0.11½@0.12
Imported, non-arsenical, furnace size, ex-ship, per unit.....	0.13½
Imported, arsenical, furnace size, ex-ship, per unit.....	0.13@0.13½
Imported, fines, arsenical, ex-ship.	0.11½@0.12
Imported, fines, non-arsenical, ex-ship, per unit.....	0.12½
Pyrite prices are per unit of sulphur. A deduction of 25c. per ton from furnace-size price is made when ore is delivered in large lumps.	
Sodium cyanide, 120 to 130% KCN (per 100%).....lb.	0.21
nitrate 95% spot.....cwt.	2.60
95% future. . . .cwt.	2.52½@2.60
Sulphur, Louisiana prime, N. Y, lg. ton	22.00@22.50
roll.....cwt.	1.85@2.15
flour.....cwt.	2.00@2.40
flowers, sublimed.....cwt.	2.20@2.60
pow. com., bags.....cwt.	1.50
Sicilian, crude brimstone lg. ton	22.50
Zinc chloride, granular.....lb.	0.04½@0.04¾

*F.o.b. Florida or Georgia ports. †F.o.b. Mt. Pleasant. ‡On vessel Ashley River, S.C.

Note—These quotations are for ordinary wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. In the cases of some of the important minerals, such as phosphate rock, pyrites and sulphur, in which there are well established markets, the quotations are substantially representative. But in the cases of some of the minor mineral products, the quotations represent what dealers ask of consumers and not what producers can realize in their selling output on private contract.

Potash Salts—Exports of potash salts from Germany nine months ended Sept. 30, metric tons:

	Total	To U.S.
Crude Salts.....	920,171	447,667
Potassium chloride.....	216,922	146,440
Potassium sulphate.....	61,040	24,887
Potassium-magnesium sulphate	41,990	7,952
Total.....	1,240,123	626,946

Exports to the United States were 50.6% of the total. No comparison can be made with 1911, as the German statistical office has introduced a new classification this year.

Mining Stocks

New York, Dec. 4—Nov. 28 was a holiday. On Nov. 29 the Exchange was dull and irregular, chiefly on account of high rates of interest, and money bringing as much as 20%. Mining stocks on the Curb were rather slow, with small fluctuations.

Nov. 30 the Exchange was still quiet, with small business. The Curb was dull, and mining stocks irregular and generally weaker except Braden Copper.

Dec. 2, the Exchange was unsettled by the decision of the Supreme Court declaring illegal the Union-Southern Pacific merger, but the effect was not great. The Curb was dull and uneven, but copper stocks were firm, especially Braden.

Dec. 3 and 4 there were few changes on the Exchange, and even the Pacific railroad issues rather quiet, notwithstanding the merger decision. The Curb was a little more active, copper stocks being generally firm. In other mining shares, dealings were not heavy and there were only small changes in quotations.

Boston, Dec. 3—Copper shares lack animation and a general heavy tone prevails. Money has been a factor, call rates touching 9% today. A few active spots developed in the mining share list during the week, Pond Creek and Butte & Superior especially, the former a coal mining proposition, and the latter a zinc mine.

Several increases have been made in copper-mining dividends, but with little effect on stock-market prices. The Copper Range Consolidated has increased its rate from 50c. quarterly to 75c., the Calumet & Hecla from $1 quarterly to $1.25 and the Superior & Pittsburg from 30 to 38c. The Old Dominion Co. did not change its quarterly rate from $1.25, as some had expected it would.

Superior & Boston has levied a $1 assessment, payable Jan. 4, which the management claims will be sufficient to put the company on an earning basis and retire outstanding notes. The capitalization of the East Butte has been increased to 410,000 shares through exchange of the Reed interests of 110,000 shares for the purchase of the Pittsmont property made some four years ago.

Trading on the Curb has been in specialties and of fair volume. Mexican

Copper Smelters' Reports

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	Sept.	October	Sept.
Alaska shipments.	1,726,715	1,435,235	.....
Anaconda.....	24,500,000	25,250,000	24,250,000
Arizona, Ltd.....	3,340,000	3,200,000	.....
Copper Queen.....	9,103,861	8,184,575	8,807,940
Calumet & Ariz....	4,462,000	4,404,000	4,918,000
Chino.....	3,217,369	3,638,500	.....
Detroit.....	1,881,668	1,934,828	1,968,620
East Butte.....	1,250,000	.....	.....
Mammoth.....	1,834,937	.....	.....
Giroux.....	1,005,208	.....	.....
Mason Valley.....	1,200,000	1,563,700	.....
Nevada Con.....	5,607,578	850,741	.....
Ohio.....	635,000	.....	.....
Old Dominion.....	2,204,000	2,523,000	.....
Ray.....	2,978,404	.....	.....
Shannon.....	1,142,000	1,210,000	.....
South Utah.....	225,568	.....	.....
United Verde*.....	2,750,000	2,750,000	.....
Utah Copper Co....	6,616,887	2,022,352	.....
Lake Superior*....	19,250,000	21,500,000	.....
Non-rep. mines*...	8,094,792	8,250,000	.....
Total production.	103,025,987	.....	.....
Imports, bars, etc..	25,149,329	.....	.....
Total blister.....	128,175,316	.....	.....
Imp. in ore & matte	7,142,232	.....	.....
Total American..	135,317,548	.....	.....
Miami†.....	2,949,150	2,577,750	2,972,000
Brit. Col. Cos.:			
British Col. Copper	.....	1,013,000	.....
Granby	2,083,118	.....	.....
Mexican Cos.:			
Boleo†.....	.....	2,612,400	.....
Cananea	3,500,000	4,248,000	.....
Moctezuma	771,844	3,045,667	2,112 377
Other Foreign:			
Cape Cop., S. Africa	678,720	757,120	.....
Kyshtim, Russia...	1,750,000	.....	.....
Spassky, Russia....	981,120	974,400	.....
Tilt Cove, Newf'd..	.....	86,785	.....
Exports from:			
Chile.....	6,048,000	8,512,000	.....
Australia	7,616,000	9,520,000	.....
Arrivals in Europe‡	8,518,720	13,771,520	.....

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡Does not include the arrivals from the United States, Australia or Chile.

Statistics of Copper

Month	U.S.Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
XI, 1911.....	111,876,601	68,039,776	67,049,279
XII.....	122,896,697	65,988,474	79,238,716
Year	1,431,938,338	709,611,605	754,902,233
I, 1912.....	119,337,753	62,343,901	80,167,904
II.....	116,035,809	56,228,368	63,148,096
III.....	125,694,601	67,487,466	58,779,566
IV	125,464,644	69,513,846	53,252,326
V.....	126,737,836	72,702,277	69,485,945
VI.....	122,315,240	66,146,229	61,449,650
VII.....	137,161,129	71,094,381	60,121,331
VIII.....	145,628,521	78,722,418	70,485,150
IX.....	140,089,819	63,460,810	60,264,796
X.....	145,405,453	84,104,734	47,621,342
XI.....	.....	.....	.....

	Visible Stocks		
	United States	Europe	Total
XII, 1911.....	111,785,188	164,281,600	276,066,788
I, 1912.....	89,454,695	158,323,200	247,777,895
II.....	66,280,643	154,851,200	221,131,843
III.....	62,939,988	141,142,400	204,082,387
IV.....	62,367,557	136,819,200	199,186,757
V.....	65,066,029	134,176,000	199,242,029
VI	49,615,643	117,801,600	167,417,243
VII.....	44,335,004	108,186,000	152,521,004
VIII.....	50,280,421	113,299,200	163,579,621
IX.....	46,701,374	113,568,000	160,269,374
X.....	63,065,587	107,408,000	170,473,587
XI.....	76,744,964	103,801,600	180,546,564
XII.....	.....	96,947,200	.....

Metal receipts sold up from 55c. to $1.06¼ on news that new blood had entered the management and that developments are favorable. South Lake rose on favorable reports from the property. Butte Central has also continued active and strong.

Assessments

Company	Delinq	Sale	Amt.
Black Horse, Ida.	Oct. 10	Dec. 7	$0.01½
Butte & Anaconda, Mont.	Jan. 1	Feb. 1	0.0[illegible]
Consolidated Virginia, Nev.	.....	.....	0.15
Crown Point, Utah	Nov. 15	Dec. 10	0.01
East Hercules Ext., Ida.	Dec. 15	Jan. 3	0.001½
Echo, Ida.	Dec. 11	Jan. 8	0.001
Hider Nevada, Utah	Dec. 20	Jan. 11	0.0[illegible]
Holy Terror, Ida.	Oct. 18	Dec. 9	0.001
Honolulu, Ida.	Nov. 20	Dec. 21	0.001½
Hub, Ida.	Nov. 14	Dec. 14	0.001
Hugo, Ida.	Nov. 9	Dec. 9	0.001
Hypotheek, Ida.	Dec. 18	Jan. 10	0.005
Jack Waite, Ida.	Nov. 30	Dec. 21	0.01
Laclede, Ida.	Nov. 18	Dec. 9	0.003
Leroy Gold & Copper, Ida.	Nov. 28	Dec. 28	0.002
Lucky Swede, Ida.	Nov. 15	Dec. 15	0.002
Mayflower, Ida	Nov. 27	Dec. 27	0.005
Melcher, Utah	Nov. 23	Dec. 12	0.02
Military, Ida.	Oct. 29	Dec. 11	.0003½
Moon Creek, Ida.	Dec. 4	Jan. 4	0.002
Nabob, Ida.	Dec. 2	Dec. 23	0.005
National Copper, Ida.	Nov. 15	Dec. 10	0.01
North Star, Ida.	Nov. 30	Dec. 30	0.001
Ophir, Nev.	Nov. 11	Dec. 9	0.15
Seven Troughs Mon., Utah.	Dec. 15	Jan. 6	0.0½
Sierra Nevada, Nev.	.....	.....	0.10

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1910	1911	1912	1910	1911	1912
January	52.375	53.795	56.260	24.154	24.865	25.887
February	51.534	52.222	59.043	23.794	24.081	27.190
March	51.454	52.745	58.375	23.690	24.324	26.875
April	53.221	53.325	59.207	24.483	24.595	27.284
May	53.870	53.308	60.880	24.797	24.583	28.038
June	53.462	53.043	61.290	24.651	24.486	28.215
July	54.150	52.630	60.654	25.034	24.286	27.919
August	52.912	52.171	61.606	24.428	24.082	28.375
September	53.295	52.440	63.078	24.567	24.209	29.088
October	55.490	53.340	63.471	25.596	24.594	29.299
November	55.635	55.719	62.792	25.680	25.649	29.012
December	54.428	54.905	.....	25.160	25.349	.....
Year	53.486	53.304	.....	24.670	24.592	.....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	New York				London, Standard	
	Electrolytic		Lake			
	1911	1912	1911	1912	1911	1912
January	12.295	14.094	12.680	14.337	55.600	62.760
February	12.256	14.084	12.611	14.329	54.974	62.893
March	12.139	14.698	12.447	14.868	54.704	65.884
April	12.019	15.741	12.275	15.930	54.034	70.294
May	11.989	16.031	12.214	16.245	54.313	72.352
June	12.385	17.234	12.611	17.443	56.365	78.259
July	12.463	17.190	12.720	17.353	56.673	76.636
August	12.405	17.498	12.634	17.644	56.266	78 670
September	12.201	17.508	12.508	17.698	55.253	78.762
October	12.189	17.314	12.370	17.661	55.170	76.389
November	12.616	17.326	12.769	17.617	57.253	76.890
December	13.552	.....	13.768	.....	62.068	.....
Year	12.376	.....	12.634	.....	55.973	.....

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41.255	42 529	July	42 400	44.519
February	41 614	42.962	August	43 319	45.857
March	40.157	42.577	September	39 755	49.135
April	42 185	43.923	October	41.185	50.077
May	43.115	46.053	November	43.125	49.891
June	44.606	45 815	December	44.655	.....
			Av. Year	42.281	.....

Prices are in cents per pound.

LEAD

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	4.483	4.435	4.334	4.327	13.009	15.597
February	4.440	4.026	4.266	3.946	13.043	15.738
March	4.394	4.073	4.238	4.046	13.122	15.997
April	4.412	4.200	4.262	4.118	12.889	16.331
May	4.373	4.194	4.223	4 072	12.984	16.509
June	4.435	4.392	4.292	4.321	13.260	17.588
July	4.499	4.720	4.397	4.603	13.530	18 544
August	4.500	4.569	4 406	4.452	14.260	19.655
September	4.485	5.048	4.356	4.924	14 744	22.292
October	4.265	5.071	4.139	4.894	15.332	20.630
November	4.298	4.615	4.181	4.463	15.821	18.193
December	4.450	.....	4.332	.....	15.648	.....
Year	4.420	.....	4.286	.....	13.970	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	5.452	6.442	5.302	6.292	23.887	26.642
February	5.518	6.499	5.368	6.349	23.276	26.661
March	5.563	6.626	5.413	6.476	23.016	26.048
April	5.399	6.633	5.249	6.483	23.743	25.644
May	5.348	6.679	5.198	6.529	24.375	25.790
June	5.520	6.877	5.370	6.727	24.612	25.763
July	5.695	7.116	5.545	6.966	25.006	26.174
August	5.953	7.028	5.803	6.878	26.801	26.443
September	5 869	7.454	5.719	7.313	27.750	27.048
October	6.102	7.426	5.951	7.276	27.256	27.543
November	6.380	7.371	6.223	7.221	26.795	26.804
December	6.301	.....	6.151	.....	26.849	.....
Year	5.758	.....	5.608	.....	25.281	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer		Basic		No. 2 Foundry	
	1911	1912	1911	1912	1911	1912
January	$15.90	$15.12	$14.40	$13.32	$14.75	$14.00
February	15.90	15.03	14.50	13.28	14.81	14.01
March	15.90	14.95	14.65	13.66	14.96	14.10
April	15.90	15.13	14.65	13.90	15.00	14.15
May	15.90	15.14	14.30	13.90	14.72	14.12
June	15.90	15.15	14.06	14.11	14.56	14.22
July	15.90	15.15	14.03	14.38	14.53	14.38
August	15.90	15.43	14.00	14.90	14.47	14.85
September	15.90	16.86	13.57	16.03	14.40	15.63
October	15.43	17.90	13.44	17.18	14.34	17.22
November	14.92	18.07	13.30	17.09	14.25	18.00
December	15.15	.....	13.10	.....	13.90	.....
Year	$15.72	.....	$13.94	.....	$14.49	.....

STOCK QUOTATIONS

COLO. SPRINGS Dec. 3

Name of Comp.	Bid.
Acacia	.04½
Cripple Cr'k Con.	.01⅛
C. K. & N.	.16½
Doctor Jack Pot.	.06½
Elkton Con.	.65½
El Paso	6.10
Findlay	.04½
Gold Dollar	.18½
Gold Sovereign	.02½
Isabella	.19½
Jack Pot	.05½
Jennie Sample	.06
Lexington	.0065
Moon Anchor	.01
Old Gold	.03¾
Mary McKinney	.75
Pharmacist	.01½
Portland	1.05
Vindicator	.86
Work	.01

SALT LAKE Dec. 3

Name of Comp.	Bid.
Beck Tunnel	.09½
Black Jack	.11½
Cedar Talisman	.00½
Colorado Mining	.21½
Columbus Con.	.12
Crown Point	.04
Daly-Judge	6.15
Grand Central	.85
Iron Blossom	1.30
Little Bell	‡.25
Lower Mammoth	.06
Mason Valley	12.00
May Day	.21
Nevada Hills	1.40
New York	.00½
Prince Con	1 67½
Silver King Coal'n	3.15
Sioux Con.	.03½
Uncle Sam	.12
Yankee	.15

TORONTO Dec. 3

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	7.50	Foley O'Brien	.20
Hudson Bay	‡60.00	Hollinger	15 15
Temiskaming	.43	Imperial	.03
Wettlaufer-Lor.	.25½	Pearl Lake	.23
Am. Goldfield	‡.40	Porcu. Gold	.19½
Apex	.01½	Preston E. D.	.04½
Crown Chartered	.03	Rea	.25
Dobie	‡.25	Standard	‡.00½
Dome	20.07½	Swastika	.09
Dome Exten.	.09	West Dome	‡.13

SAN FRANCISCO Dec. 3

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.05	Belmont	8.50
Belcher	.24	Jim Butler	.57
Best & Belcher	.05	MacNamara	.18
Caledonia	.80	Midway	.33
Challenge Con.	.07	Mont.-Tonopah	1.97½
Chollar	.02	North Star	.24
Confidence	.44	West End Con.	1.35
Con. Virginia	.37	Atlanta	.14
Crown Point	.40	Booth	.04
Gould & Curry	.01	C.O.D. Con	.05
Hale & Norcross	.09	Comb. Frac	.08
Mexican	1.80	Jumbo Extension	.27
Occidental	.70	Pitts.-Silver Peak	.75
Ophir	.37	Silver Pick	.05
Overman	.50	St. Ives	.30
Potosi	.03	Tramp Con.	‡.02
Savage	.09	Argonaut	‡2.00
Sierra Nevada	.36	Bunker Hill	‡4.50
Union Con.	.29	Central Eureka	.22
Yellow Jacket	.30	So. Eureka	‡1.50

N. Y. EXCH. Dec. 3

Name of Comp.	Clg.
Amalgamated	83¾
Am. Agri. Chem.	56⅜
Am.Sm.&Ref.,com	78
Am. Sm. & Ref., pf.	106
Am. Sm. Sec., pf. B	85
Anaconda	42¾
Batopilas Min.	1½
BethlehemSteelpf	69
Chino	46¼
Federal M. & S., pf.	42
Goldfield Con.	1⅞
GreatNor.,ore.,ctf.	45½
Guggen. Exp.	54¼
Homestake	102
Inspiration Con.	19½
Miami Copper	27¾
Nat'nalLead,com.	60¼
National Lead, pf.	108½
Nev. Consol.	22⅝
Phelps Dodge	215½
Pittsburg Coal, pf.	91
Ray Con.	22¾
RepublicI&S,com.	27½
Republic I & S, pf.	89
SlossSheffi'd,com.	48½
Sloss Sheffield, pf.	96
Tennessee Copper	41
Utah Copper	63¼
U. S. Steel, com.	73⅛
U. S. Steel, pf.	110¼
Va. Car. Chem.	46¼

N. Y. CURB Dec. 3

Name of Comp.	Clg.
Barnes King	‡.60
Beaver Con.	.46
Braden Copper	10½
B. C. Copper	4⅝
Buffalo Mines	2½
Caledonia	.40
Con. Ariz. Sm.	7/16
Davis-Daly	2⅛
Diam'field-Daisy	4
Ely Con.	.11
Florence	.65
Giroux	3⅝
Gold Hill Con.	3/16
Greene Cananea	9⅜
Greenwater	.04
Internat. S. & R.	‡124
Kerr Lake	2⅝
Keystone	2
La Rose	2⅜
McKinley-Dar-Sa.	2⅛
Min. Co. of A. new	2⅝
Motherlode Gold.	‡.60
Nev. Utah M. & S.	‡.05
Nipissing Mines	8¾
Ohio Copper	1¾
Pacific Sm. & M.	2/16
Puebla S. & R.	‡2
South Live Oak	2
South Utah M. & S.	3/16
Standard Oil (Old)	1110
Stand'd Oil of N.J.	389
Stewart	1⅛
Tonopah	6½
Tonopah Ex	2⅜
Tonopah Merger	.78
Tri-Bullion	11/16
Tularosa	1⅛
Union Mines	1/16
United Cop., pfd.	10
Yukon Gold	3

LONDON Dec. 4

Name of Com.	Clg.
Camp Bird	£1 3s 3d
Dolores	1 10 0
El Oro	0 17 3
Esperanza	2 2 6
Mexico Mines	7 7 6
Oroville	0 5 0
Stratton'sInd.	0 3 1½
Tomboy	1 8 3

BOSTON EXCH. Dec. 3

Name of Comp.	Clg.
Adventure	‡6
Ahmeek	‡325
Algomah	3¼
Allouez	42
Am. Zinc	30¾
Ariz. Com., ctfs.	3⅞
Bonanza	‡.30
Boston & Corbin	5¼
Butte & Balak	3½
Calumet & Ariz	79
Calumet & Hecla	575
Centennial	18¾
Cliff	‡3
Copper Range	55⅛
Daly West	3⅝
East Butte	14⅜
Franklin	9½
Granby	72½
Hancock	26½
Hedley Gold	‡25½
Helvetia	‡¾
Indiana	17
Island Cr'k, com.	57
Island Cr'k, pfd.	‡87
Isle Royale	34½
Keweenaw	2
Lake	28¾
La Salle	5¾
Mass	‡6
Michigan	‡1¾
Mohawk	64
New Arcadian	3
New Idria Quick.	‡5⅛
North Butte	36
North Lake	‡3½
Ojibway	‡3
Old Dominion	58⅛
Osceola	108⅝
Quincy	‡86
Shannon	14
Shattuck-Ariz.	31¾
Superior	‡43
Superior & Bost.	1/16
Tamarack	41
Trinity	5
Tuolumne	‡2½
U. S. Smelting	44½
U. S. Smelt'g, pf.	51
Utah Apex	2 1/16
Utah Con.	11⅛
Victoria	‡2½
Winona	‡4
Wolverine	73
Wyandot	1½

BOSTON CURB Dec. 3

Name of Comp.	Last
Alaska Gold M.	9/16
Bingham Mines	4¼
Boston Ely	1 5/16
Boswyocolo	.01
Butte Central	9
Cactus	.08
Calaveras	2⅛
Chief Cons	7/8
Corbin	.24
Cortez	.70
Crown Reserve	3⅜
First Nat. Cop.	1½
Majestic	45
Mazatan	‡½
Moneta Porc.	‡.03
Nevada-Douglas	3 1/16
New Baltic	1½
Oneco	1⅝
Raven Copper	.22
Portsmouth Coal	.05
San Antonio	‡3½
Smokey Dev.	1⅜
S. W. Miami	5½
South Lake	6½
Trethewey	.32
United Verde Ext.	.54

‡Last quotation.

Mining Companies—United States

Name of Company and Situation		Shares Issued	Par	Dividends Total	Latest	Amt
Acacia, g.	Colo.	1,438,989	$ 1	$ 129,618	Jan. '11	$0.01
Adams, s.l.c.	Colo.	80,000	10	778,000	Dec. '09	0.04
Ahmeek, c.	Mich.	50,000	25	1,000,000	Oct. '12	6.00
Alaska Mexican, g.	Alas.	180,000	5	3,093,381	Nov. '12	0.30
Alaska Treadwell, g.	Alas.	200,000	25	12,710,000	Nov. '12	1.00
Alaska United, g.	Alas.	180,200	5	1,162,290	Nov. '12	0.50
Am. Zinc, Lead & Sm.	U. S.	165,360	25	938,360	Oct. '12	0.50
Anaconda, c.	Mont.	4,332,500	25	68,420,625	Oct. '12	0.75
Argonaut, g.	Cal.	200,000	5	1,200,000	June '10	0.05
Arizona Copper, pf.	Ariz.	1,426,120	1.20	2,057,233	Nov. '12	0.047
Arizona Copper, com.	Ariz.	1,519,896	1.20	14,691,796	July '12	0.30
Bagdad-Chase, g., pf.	Cal.	84,819	5	202,394	Jan. '09	0.10
Baltic, c.	Mich.	100,000	25	7,050,000	June '11	5.00
Bingham N. H., c.	Utah	228,690	5	294,219	July 12	0.10
Bonanza Dev., g.	Colo.	300,000	1	1,425,000	Oct. '11	0.20
Bunker Hill Con., g.	Cal.	200,000	1	670,000	Nov. '12	0.05
Bunker Hill & Sul., l.s.	Ida.	327,000	10	13,846,350	Nov. '12	0.20
Butte-Alex Scott, c.	Mont.	74,000	10	74,000	Nov. '12	0.50
Butte & Ballaklava, c.	Mont.	250,000	10	125,000	Aug. '10	0.50
Caledonia, l.s.c.	Ida.	1,300,000	1	52,000	June '10	0.01
Calumet & Arizona, c.	Ariz.	596,353	10	15,478,118	Sept. '12	1.00
Calumet & Hecla, c.	Mich.	100,000	25	118,850,000	Sept. '12	12.00
Camp Bird, g.s.	Colo.	1,100,000	5	8,383,558	July '12	0.24
Centen'l-Eur., l.s.g.c.	Utah	100,000	5	3,600,000	Oct. '12	1.50
Center Creek, l.z.	Mo.	100,000	10	445,000	Oct. '12	0.05
Champion, c.	Mich.	100,000	25	7,500,000	Nov. '12	1.00
Cliff, g.	Utah	300,000	1	90,000	Feb. '12	0.10
Cliff, g.	Alas.	100,000	1	180,000	Nov. '12	0.05
Colo. Gold Dredging.	Colo.	100,000	10	200,000	Nov. '12	0.25
Colorado, l.s.g.	Utah	1,000,000	0.20	2,570,000	June '12	0.03
Columbus Con., g.s.	Utah	285,540	5	226,832	Oct. '07	0.20
Commercial Gold.	Ore.	1,750,000	1	43,750	Dec. '10	0.00½
Con. Mercu., g.	Utah	1,000,000	1	3,415,313	July '12	0.03
Continental, z. l.	Mo.	22,000	25	275,000	July '12	0.50
Copper Range Con., c.	Mich.	393,445	100	12,906,711	Oct. '12	0.50
Daly Judge, s.l.	Utah	300,000	1	405,000	Oct. '12	0.15
Daly West, s.l.	Utah	180,000	20	6,565,000	Oct. '12	0.15
Doctor Jackpot, g.	Colo.	3,000,000	0.10	90,000	Mar. '11	0.00½
Doe Run, l.	Mo.	65,782	100	3,139,176	Sept. '12	1.50
Elkton Con., g.	Colo.	2,500,000	1	3,079,460	Nov. '12	0.02
El Paso, g.	Colo.	490,000	5	1,597,295	Oct. '12	0.10
Fed. M. & S., com.	Idaho.	60,000	100	2,708,750	Jan. '09	1.50
Fed. M. & S., pf.	Idaho.	120,000	100	7,488,685	Sept. '12	1.50
Florence, g.	Nev.	1,050,000	1	840,000	Apr. '11	0.10
Frances-Mohawk, g.	Nev.	912,000	1	546,000	Jan. '08	0.05
Free Coinage, g.	Colo.	10,000	100	180,000	Dec. '09	1.00
Fremont Con., g.	Calif.	200,000	2.50	166,000	Nov. '12	0.02
Frontier, z.	Wis.	1,250	100	146,272	Nov. '12	2.00
Gemini-Key'ne, l.g.s.	Utah	5,000	100	2,130,000	Oct. '11	6.00
Gold Chain, g.	Utah	1,000,000	1	40,000	Sept. '12	0.02
Gold Coin of Victor.	Colo.	1,000,000	1	1,350,000	Feb. '09	0.02
Gold Dollar Con.	Colo.	2,500,000	0.10	87,500	Sept. '12	0.00½
Gold King Con., g.	Colo.	5,750,370	1	1,407,319	Dec. '11	0.03
Golden Cycle, g.	Colo.	1,500,000	5	2,160,000	Nov. '12	0.02
Golden Star, g.	Ariz.	400,000	5	140,000	Mar. '10	0.05
Goldfield Con., g.	Nev.	3,558,367	10	23,839,066	Oct. '12	0.30
Grand Central, g.	Utah	500,000	1	1,470,750	Oct. '12	0.05
Granite, g.	Colo.	1,650,000	1	269,500	Nov. '12	0.01
Hazel, g.	Cal.	900,000	1	864,000	July '12	0.01
Hecla, l.s.	Idaho.	1,000,000	0.25	2,600,000	Nov. '12	0.02
Hercules, l.s.	Idaho.	1,000,000	1	3,650,000	July '11	0.06
Homestake, g.	S. D.	218,400	100	28,740,440	Nov. '12	0.50
Horn Silver, l.s.z.	Utah	400,000	25	5,662,000	Sept. '07	0.05
Iowa, g.s.l.	Colo.	1,666,667	1	200,166	June '11	0.00½
Iowa-Tiger Leasing g.s.	Colo.	12,655	1	13,921	Jan. '12	0.10
Iron Blossom, s.l.g.	Utah	1,000,000	0.10	1,370,000	Oct. '12	0.10
Iron Silver, s.l.g.	Colo.	500,000	20	4,500,000	Jan. '12	0.10
Jamison, g.	Cal.	390,000	10	378,300	Jan. '11	0.02
Jerry Johnson, g.	Colo.	2,500,000	0.10	150,000	Aug. '11	0.01
Kendall, g.	Mont.	500,000	5	1,375,000	Jan. '12	0.02
Kennedy, g.	Cal.	100,000	100	1,831,001	Apr. '10	0.03
King of Arizona, g.	Ariz.	200,000	1	396,000	Aug. '09	0.12
Klar Piquett, s.l.	Wis.	20,000	1	147,500	Sept. '12	0.25
Knob Hill, g.	Wash.	1,000,000	1	45,000	May '12	0.00½
Liberty Bell, g.	Colo.	130,551	5	522,093	Oct. '10	1.00
Little Bell, l.s.	Utah	300,000	1	75,000	Mar. '11	0.05
Little Florence, g.	Nev.	1,000,000	1	430,000	Jan. '08	0.03
Mammoth, g.s.c.	Utah	400,000	25	2,280,000	Oct. '12	0.15
Mary McKinney, g.	Colo.	1,309,252	1	986,011	Oct. '12	0.02
May Day, g.s.l.	Utah	800,000	0.25	108,000	Sept. '08	0.01½
Mexican, g.s.	Nev.	201,600	2.50	20,160	Aug. '11	0.10
Miami, c.	Ariz.	664,993	5	997,408	Nov. '12	0.50
Modoc, g.s.	Colo.	500,000	1	275,000	Dec. '11	0.01
Mohawk M. Co.	Mich.	100,000	25	2,675,000	Aug. '12	2.50
Monarch-Mad'a, g.s.l.	Colo.	1,000,000	1	40,000	May '11	0.01
Montana-Tonop., s.g.	Nev.	921,865	1	430,000	June '12	0.10
Mountain, c.	Cal.	250,000	25	4,216,250	May '08	0.44
National, g.	Nev.	750,000	1	570,000	May '11	0.10
Nevada Con., c.	Nev.	1,999,394	5	8,977,870	Sept. '12	0.37½
New Century, z.l.	Mo.	330,000	1	237,600	Oct. '09	0.01
New Idria, q.	Cal.	100,000	5	1,630,000	Oct. '12	0.30
North Butte, c.	Mont.	410,000	15	10,453,000	Oct. '12	0.50
North Star, g.	Cal.	250,000	10	3,661,989	Sept. '12	0.30
Old Domin'n, M. & Sm.	Ariz.	162,000	25	2,556,000	Oct. '12	1.25
Ophir, s. g.	Nev.	201,600	3	2,068,360	Jan. '12	0.10
Opohongo, g.s.l.	Utah	898,978	0.25	62,927	Oct. '12	0.02
Oroville Dredging.	Cal.	700,000	5	1,383,036	Dec. '09	0.12½
Osceola, c.	Mich.	96,150	25	10,881,650	Oct. '12	3.00
Parrot, c.	Mont.	229,850	10	7,152,399	Nov. '12	0.15
Pearl Con., g.	Wash.	1,909,711	0.05	181,422	Dec. '10	0.02
Pharmacist, g.	Colo.	1,500,000	1	87,500	Feb. '10	0.00½
Pioneer, g.	Alas.	5,000,000	1	4,041,526	Oct. '11	0.03
Pittsburgh-Idaho, l.	Ida.	803,000	1	216,810	Oct. '12	0.04
Pittsburgh Silver Peak, g.	Nev.	2,790,000	1	502,200	Oct. '12	0.02
Portland, g.	Colo.	3,000,000	1	9,157,080	Oct. '12	0.02
Quilp.	Wash.	1,500,000	1	67,500	Feb. '12	0.01
Quincy, c.	Mich.	110,000	25	20,363,000	Sept. '12	1.25
Republic, g.	Wash.	1,000,000	1	85,000	Dec. '10	0.01½
Rochester, l.z.	Mo.	4,900	100	188,396	Dec. '10	0.50
Round Mountain, g.	Nev.	866,426	1	328,404	Sept. '10	0.04
Seven Troughs Coal. g.	Utah	1,500,000	1	37,500	July '12	0.02½
St. Joseph, l.	Mo.	1,000,000	10	8,408,357	Sept. '12	0.15

Mining Companies—United States—(*Continued*)

Name of Company and Situation		Shares Issued	Par	Dividends Total	Latest	Amt
Shannon, c.	Ariz.	300,000	$10	$ 600,000	Oct. '07	$0.50
Shattuck-Arizona, c.	Ariz.	350,000	10	1,050,000	Jan. '11	1.00
Silver King Coal. l.s.	Utah	1,250,000	5	1,659,885	Jan. '10	0.15
Sioux Con., s.l.g.	Utah	745,389	1	872,097	July '11	0.04
Skidoo, g.	Cal.	1,000,000	5	275,000	May '12	0.02½
Smuggler, l.s.z.	Colo.	1,000,000	1	2,235,000	Nov. '06	0.03
Snowstorm, c.g.	Ida.	1,500,000	1	1,079,655	Oct. '12	0.03
South Eureka, g.	Calif.	299,981	1	366,881	Apr. '12	0.07
Standard Con., g.s.	Cal.	178,394	10	5,229,809	Jan. '12	0.10
Stratton's Ind., g.	Colo.	1,000,000	0.60	364,500	Apr. '12	0.06
Success, z.	Ida.	1,500,000	1	835,000	Sept. '12	0.03
Superior & Pitts., c.	Ariz.	1,499,793	10	3,089,574	Sept. '12	0.30
Tamarack, c.	Mich.	60,000	25	9,420,000	July '07	4.00
Tennessee, c.	Tenn.	200,000	25	3,106,520	Aug. '12	1.00
Tomboy, g. s.	Colo.	300,000	4.85	2,918,430	June '12	0.24
Tom Reed, g.	Ariz.	909,555	1	946,023	Nov. '12	0.07
Tonopah Belm't, s.g.	Nev.	1,500,000	1	3,593,000	Oct. '12	0.25
Tonopah Ext., g.s.	Nev.	943,433	1	330,201	Oct. '12	0.02½
Tonopah of Nev., s.g.	Nev.	1,000,000	1	9,650,000	Oct. '12	0.40
Tri-Mountain, c.	Mich.	100,000	25	950,000	Dec. '10	1.00
Tuolumne, c.	Mont.	800,000	1	360,000	Aug. '11	0.15
Uncle Sam, g. s. l.	Utah	500,000	1	495,000	Sept. '11	0.05
United Cop. Min., c.	Wash.	1,000,000	1	40,000	Nov. '12	0.01
United (Crip. Ck.) g.	Colo.	4,000,100	1	440,435	Jan. '10	0.04
United Globe, c.	Ariz.	23,000	10	839,500	Oct. '12	7.50
United Verde, c.	Ariz.	300,000	10	30,997,000	Sept. '12	0.75
Utah, s.l.	Utah	100,000	10	325,000	Dec. '10	0.02
Utah, c.	Utah	1,562,599	10	15,048,516	Sept. '12	0.75
Utah Con., c.	Utah	300,000	5	7,200,000	May '12	0.50
Valley View, g.	Colo.	1,000,000	1	240,000	Dec. '10	0.04
Victoria, g.s.l.	Utah	250,000	1	207,500	Mar. '10	0.04
Vindicator Con., g.	Colo.	1,500,000	1	2,587,000	Oct. '12	0.03
Wasp No. 2, g.	S. D.	500,000	1	371,966	Nov. '12	0.02
Wellington Mines, g.	Colo.	10,000,000	1	200,000	July '12	0.00½
Wolverine, c.	Mich.	60,000	25	7,440,000	Oct. '12	5.00
Work, g.	Colo.	1,500,000	1	172,500	July '08	0.00½
Yak, s.l.	Colo.	1,000,000	1	1,417,685	Oct. '10	0.04
Yankee Con., g.s.	Utah	1,000,000	1	182,500	July '07	0.01½
Yellow Aster, g.	Cal.	100,000	10	1,081,789	Jan. '12	0.05
Yellow Pine, l.z.s.	Nev.	950,000	1	104,508	Nov. '12	0.02
Yukon Gold, g.	Alas.	3,500,000	5	4,210,000	Sept. '12	0.07½

Coal, Iron, Industrial and Holding Companies

Amalgamated, c.	Mont.	1,538,879	$100	$72,043,159	Nov. '12	$1.50
Am. Sm. & Ref., com.	U. S.	500,000	100	23,208,333	Sept. '12	1.00
Am. Sm. & Ref., pf.	U. S.	500,000	100	41,708,333	Sept. '12	1.75
Am. Smelters, pf. A	U. S.	170,000	100	7,110,000	Oct. '12	1.50
Am. Smelters, pf. B	U. S.	300,000	100	10,607,000	Oct. '12	1.25
Cambria Steel	Penn.	900,000	50	16,210,000	Nov. '12	0.62½
Consolidation Coal	Md.	190,247	100	20,833,042	Oct. '12	1.50
Greene Cananea	U. S.	2,471,314	25	1,856,454	Nov. '12	0.25
Guggenheim, Expl.	U. S.	831,732	25	14,689,986	Oct. '12	2.50
Inter'l Nickel, com.	U. S.	115,826	100	6,296,671	Sept. '12	7.00
Inter'l Nickel, pfd.	U. S.	89,126	100	3,743,189	Nov. '12	1.50
Inter'l Sm & Ref.	U. S.	100,000	100	2,700,000	Nov. '12	2.00
Lehigh Coal & Nav.	Penn.	482,956	50	22,535,092	Nov. '12	1.00
National Lead, com.	N. Y.	206,554	100	7,021,650	Sept. '12	0.75
National Lead, pf.	N. Y.	243,676	100	25,429,765	Sept. '12	1.75½
Old Dominion, c.	Ariz.	293,245	25	3,213,290	Oct. '12	1.25
Phelps, Dodge & Co.	U. S.	450,000	100	20,459,304	Sept. '12	2.50
Pittsburgh Coal, pf.	Penn.	297,010	100	15,137,583	July '12	1.25
U. S. Steel Corp., com.	U. S.	5,083,025	100	175,342,507	Dec. '12	1.25
U. S. Steel Corp., pf.	U. S.	3,602,811	100	319,853,982	Nov. '12	1.75
U. S. S., R. & M., com.	U.S.-Mex.	486,320	50	4,518,866	Oct. '12	0.75
U. S. Sm., R. & M., pf.	U.S.-Mex.	351,105	50	11,263,105	Oct. '12	0.87½

Canadian, Mexican and Central American Companies

Ajuchitlan, g.s.	Mex.	50,000	$ 5	$ 200,000	Oct. '12	$0.25
Amparo, g.s.	Mex.	2,000,000	1	920,000	Nov. '12	0.03
B. C. Copper	B. C.	591,709	5	526,642	Oct. '12	0.15
Beaver Con., s.	Ont.	1,996,490	1	349,890	Oct. '12	0.03
Buffalo, s.	Ont.	1,000,000	1	1,560,000	Nov. '12	0.03
Cobalt Townsite, s.	Ont.	1,000,000	1	150,000	May '12	0.05
Coniagas, s.	Ont.	800,000	5	4,160,000	Nov. '12	0.45
Con. M. & S. Co. of Can.	B. C.	58,052	100	1,014,061	Oct. '12	4.00
Crown Reserve, s.	Ont.	1,768,814	1	4,422,036	Oct. '12	0.05
Crow's Nest Pass C. Co.	B. C.	248,506	25	2,182,864	Mar. '11	0.25
Dominion Coal, com.	N. S.	150,000	100	5,400,000	July '12	1.00
Dominion Coal, pf.	N. S.	50,000	100	4,915,000	Aug. '12	3.50
Dos Estrellas, g.s.	Mex.	300,000	0.50	7,030,000	Sept. '12	2.50
El Oro, g.s.	Mex.	1,147,500	4.85	8,389,575	July '12	0.24
Esperanza, s.g.	Mex.	455,000	4.85	10,835,127	June '12	0.36
Granby, s.l.c.	B. C.	148,496	100	4,197,111	Dec. '10	1.00
Greene Con., c.	Mex.	1,000,000	10	7,594,400	Nov. '12	0.40
Guanajuato D., pf., s.	Mex.	10,000	1000	274,356	Jan. '11	3.00
Hedley Gold.	B. C.	120,000	10	684,000	Sept. '12	0.30
Hollinger, g.	Ont.	2,750,000	1	175,000	Nov. '12	0.03
Kerr Lake s.	Ont.	600,000	5	4,170,000	Sept. '12	0.25
La Rose Con., s.	Ont.	1,498,407	5	3,140,179	Oct. '12	0.12½
Le Roi No. 2, g.	B. C.	120,000	24.30	1,428,840	July '12	0.24
Lucky Tiger Com., g.	Mex.	715,337	10	1,553,736	Nov. '12	0.05
McK.-Dar. Sav. s.	Ont.	2,247,692	1	2,812,089	Oct. '12	0.10
Mines Co. of Am. (new).	Mex.	1,700,000	10	*877,500	Jan. '12	0.15
N. Y. & Hond. Ros.	C. A.	150,000	10	3,082,500	Mar. '12	0.15
Nipissing, s.	Ont.	1,200,000	5	9,090,000	Oct. '12	0.37½
Peñoles, s.l.g.	Mex.	80,000	25	5,910,688	Sept. '12	1.25
Peregrina M. & M., pf.	Mex.	10,000	100	328,656	Sept. '10	3.50
Pinguico, pf., s.	Mex.	20,000	100	600,000	Oct. '11	3.00
Right of Way Mnsts.	Ont.	1,685,500	1	202,260	Dec. '11	0.02
Rio Plata, s.	Mex.	373,437	5	354,990	Mar. '12	0.10
San Rafael, g.s.	Mex.	2,400	25	1,439,780	Oct. '12	0.90
San Toy, g.s.	Mex.	6,000,000	1	360,000	Dec. '11	0.10
Sopresa, g.s.	Mex.	19,200	20	1,517,438	Jan. '11	34.00
Stand'd Silver-Lead.	B. C.	2,000,000	1	325,000	Oct. '12	0.02½
Timiskaming, s.	Ont.	2,500,000	1	1,234,155	Oct. '12	0.03
Tim. & Hud. Bay, s.	Ont.	7,761	1	1,683,137	Oct. '12	3.00
Trethewey, s.	Ont.	1,000,000	1	861,998	July '12	0.10
Wettlaufer-Lorrain, s.	Ont.	1,416,590	1	495,807	Oct. '12	0.05

*Previous to reorganization, $5,258,881.
†Previous to January, 1910, $324,644.

INDUSTRIALS

The Ash Grove Portland Cement Co. has purchased a Ruggles-Coles dryer for treating coal.

The Proctor Engineering Co., 150 Nassau St., New York, has just issued a circular describing the new Proctor direct automatic bucket tipple.

The Penberthy Injector Co. is sending out an 80-page book, and every superintendent and engineer at all interested in engine- and boiler-room practice will want a copy.

The Wern Machinery & Engineering Co., 30 Church St., New York, announces that it is now manufacturing the "Synchron" artificial respiration apparatus in this country. It is a Swedish device.

The Industrial Car Co., West Park, Ohio, announces that its name has been changed to the Electric Locomotive & Car Co. There is no change in the ownership and the offices remain the same as heretofore.

The Hardinge Conical Mill Co., 50 Church St., New York, has just issued a booklet entitled "Advantages of the Hardinge Patent Mill Over Other Grinding Devices." Anyone interested in grinding will want a copy.

Mr. C. H. Warfield, secretary and treasurer of the Goulds Manufacturing Co., of Seneca Falls, N. Y., has resigned his position with that company. Mr. B. R. Wells has been appointed treasurer and Mr. H. S. Fredenburgh, secretary, to succeed Mr. Warfield.

The Traylor Engineering & Mfg. Co., 30 Church St., New York, is pleased to advise that they have had a great revival in business and that the orders received in the last two months have been away beyond their fondest expectations, and their works are now operating at full capacity.

The Wood Drill Works, of Paterson, N. J., claim that a large measure of the efficiency and economy of their drills is obtained because they use vanadium tungsten iron for certain parts of their rock drills, such as the cylinder, chest and air heads. They invite investigation of this feature.

Mr. C. L. Newcomb, Jr., who has been connected with the International Steam Pump Co. as Denver sales manager for the past two and a half years, has resigned and the company will close its Denver office. Mr. Newcomb will take a six months' vacation before considering any of the offers he has on hand.

The Wheeler Condenser & Engineering Co., of Carteret, N. J., manufacturer of high vacuum surface and jet condensers and general condensing machinery, announce that they have opened an office in Cleveland, Ohio, at 1325 Citizens' Building, which will be under the management of Mr. Walter G. Stephan.

It is announced that the reorganization of the Platt Iron Works Co. is completed. The new company took over all the physical assets as well as the inventory and accounts receivable from the Trustees on Sept. 30. It starts in business not only free of all floating indebtedness, but with a working capital of $700,000 as well. The new company is a Maine corporation.

The Alberger Pump & Condenser Co., of 140 Cedar St., New York, announce that they now possess the exclusive right to manufacture and sell the well known Hammond meter. This meter has been largely used in power stations for keeping an accurate record of boiler feed. It is also adaptable for measuring other fluids, and for use in modern industrial plants.

The Indianapolis office of the Western Electric Co. is shortly to move into new quarters which have been leased at 121 South Pennsylvania St. The new building, which contains 31,000 sq.ft. of floor space and is five stories high, is better adapted to the needs of the local organization than the old building, which it has occupied for the past five years.

The C. O. Bartlett & Snow Co., of Canada, Limited, has been granted a Dominion charter, to deal in, manufacture and install elevating and conveying machinery, power transmission, machinery, engines, boilers, hoisting machinery, brick machinery, garbage reduction and destruction machinery, paint machinery, grain and cereal machinery, and to carry on a general line of engineering, manufacturing and construction work.

The S. Jarvis Adams Co. wishes to announce a change of its name to Pittsburgh Iron & Steel Foundries Co.; also that its general offices will from this date be located at the works, Midland, Beaver County, Penn. All correspondence, freight (via Penn. lines, C. & P. Division) and expressage (via Adams Express) should be addressed Midland, Beaver County, Pennsylvania, and telephone communication may be established through No. 998 on the Rochester, Penn., exchange.

S. E. Hendricks Co., 74 Lafayette St., New York, have just issued the 21st annual revised edition of "Hendrick's Commercial Register of the United States for Buyers and Sellers." Its aim is to furnish complete classified lists of manufacturers in architectural, engineering, electrical, mechanical, railroad, mining, manufacturing and kindred trades and professions. It is an invaluable book of reference for every business house and is expressed to any part of the country on receipt of $10.

At the regular monthly meeting of the Board of Directors of the Joseph Dixon Crucible Co., held Monday, Oct. 21, the following changes in the officers and Board of Directors were made on account of the death of Vice-President William H. Corbin. Mr. George E. Long, former treasurer, was elected vice-president to succeed Mr. Corbin; Mr. J. H. Schermerhorn, former assistant secretary and assistant treasurer, was elected to membership in the board of directors and treasurer of the company. Mr. Albert Norris was elected to the office of assistant secretary and assistant treasurer.

The H. W. Johns-Manville Co. has recently opened a new Southern warehouse at No. 31½ South Broad St., Atlanta, Ga. The entire building, embracing three floors and a basement, with a total floor area of about 10,000 sq.ft., will be utilized exclusively as a warehouse for a stock of such J-M products as roofing, boiler and pipe coverings, cements, packings, fire extinguishers, electrical, railway and automobile supplies. A feature of particular advantage in this new site will be found in the location of the Atlanta office of the H. W. Johns-Manville Co. in the same building with the local warehouse, which will materially help to minimize the chance of delay in deliveries.

The Smooth-On Manufacturing Co. has just issued a new edition of their Smooth-On iron cement book No. 7. Smooth-On iron cement No. 7 is a hydraulic, chemical iron cement, prepared and sold in powdered form and used for waterproofing, stopping leaks of concrete, hardening concrete and for bonding concrete to concrete and brick to brick or any porous substances. The new instruction book is illustrated; the illustrations show a few of the many ways in which this Smooth-On iron cement No. 7 has been used and the results obtained. It will prove valuable and interesting reading to anyone troubled with concrete leaks or the hardening of concrete. A copy of this book will be sent free of charge to anyone sending their name and address to the Smooth-On Manufacturing Co., Jersey City, N. J.

The Fairbanks-Morse Co., of Chicago, announce: Mr. Cyril J. Atkinson, M. I. Mech. E., inventor and patentee of the Atkinson gas producer and a number of special devices pertaining to gas producers, has severed his connection with the Dornfeld-Kunert Co., of Watertown, Wis. Mr. Atkinson's services and the use of all his patents have been secured by us, and a number of Mr. Atkinson's valuable patents will be incorporated in the Fairbanks-Morse gas producers at once. This company will place Mr. Atkinson's services at the disposal of the public for adapting the Fairbanks-Morse gas producers to meet the requirements of the various industries desiring to substitute producer gas for fuel oil. This will be of particular service and effect large economies in forge shops, malleable iron foundries, galvanizing plants, enameling works, brass foundries, etc."

The Western Electric Company's family of distributing houses has been increased by the addition of one in Cleveland, Ohio, as the result of taking over the business of the Cleveland Electrical Supply Company. The Western Electric Company retains the entire personnel of the supply company which it supersedes, with the exception of R. F. La Ganke, vice-president and manager, who is retiring from active business. H. A. Speh, of the Buffalo house succeeds to the post of manager. Louis Griesser, sales manager, has been twenty years in the electrical business at Cleveland. The Cleveland house has, in Mrs. M. L. Hausman, the only saleswoman in the company's employ. The new house takes up its work with good prospects. It is probable that a warehouse will be established in the near future for the service of the Central Union Telephone in Ohio. A telephone sales department has also been organized under the supervision of F. E. Triebner, formerly of the electric company's Nashville office.

TRADE CATALOGS

Earle Gear and Machine Co., Philadelphia, Penn. Bulletin. Herringbone gears. Illustrated.

McKiernan-Terry Drill Co., 115 Broadway, New York. Bulletin. "Busy Bee" hammer drills. Illustrated, 16 pages, 6x9 inches.

Pulsometer Steam Pump Co., 17 Battery Place, New York. Catalog 18. The Pulsometer. Illustrated, 48 pages, 6x9 inches.

C. W. Hunt Co., West New Brighton, N. Y. Catalog No. 12-8. Manila Rope Transmission and Hoisting. Illustrated, 48 pages, 6x9 inches.

Reading Iron Co., Reading, Penn. Pamphlet. "Court of Actual Experience." Wrought Iron Pipe vs. Steel Pipe. Illustrated, 48 pages, 6x9 inches.

Union Construction Co., 604 Mission St., San Francisco, Calif. Catalog. Placer mining dredges for gold and tin. Illustrated, 52 pages, 7x10 inches.